

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 February 2001 (22.02.2001)

PCT

(10) International Publication Number
WO 01/12662 A2

(51) International Patent Classification⁷: **C07K 14/00**

(21) International Application Number: PCT/US00/22315

(22) International Filing Date: 14 August 2000 (14.08.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/149,641 17 August 1999 (17.08.1999) US
60/164,203 9 November 1999 (09.11.1999) US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier applications:

US 60/149,641 (CIP)
Filed on 17 August 1999 (17.08.1999)
US 60/164,203 (CIP)
Filed on 9 November 1999 (09.11.1999)

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— Without international search report and to be republished upon receipt of that report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 01/12662 A2

(54) Title: MEMBRANE ASSOCIATED PROTEINS

(57) Abstract: The invention provides human membrane associated proteins (MEMAP) and polynucleotides which identify and encode MEMAP. The invention also provides expression vectors, host cells, antibodies, agonists, and antagonists. The invention also provides methods for diagnosing, treating, or preventing disorders associated with expression of MEMAP.

MEMBRANE ASSOCIATED PROTEINS

TECHNICAL FIELD

This invention relates to nucleic acid and amino acid sequences of membrane associated
5 proteins and to the use of these sequences in the diagnosis, treatment, and prevention of cell
proliferative, autoimmune/inflammatory, neurological and gastrointestinal disorders.

BACKGROUND OF THE INVENTION

Eukaryotic cells are surrounded by plasma membranes which enclose the cell and maintain
10 an environment inside the cell that is distinct from its surroundings. In addition, eukaryotic
organisms are distinct from prokaryotes in possessing many intracellular organelle and vesicle
structures. Many of the metabolic reactions which distinguish eukaryotic biochemistry from
prokaryotic biochemistry take place within these structures. The plasma membrane and the
membranes surrounding organelles and vesicles are composed of phosphoglycerides, fatty acids,
15 cholesterol, phospholipids, glycolipids, proteoglycans, and proteins. These components confer
identity and functionality to the membranes with which they associate.

Integral Membrane Proteins

The majority of known integral membrane proteins are transmembrane proteins (TM) which
20 are characterized by an extracellular, a transmembrane, and an intracellular domain. TM domains are
typically comprised of 15 to 25 hydrophobic amino acids which are predicted to adopt an α -helical
conformation. TM proteins are classified as bitopic (Types I and II) and polytopic (Types III and IV)
(Singer, S.J. (1990) Annu. Rev. Cell Biol. 6:247-96). Bitopic proteins span the membrane once while
polytopic proteins contain multiple membrane-spanning segments. TM proteins that act as cell-
25 surface receptor proteins involved in signal transduction include growth and differentiation factor
receptors, and receptor-interacting proteins such as *Drosophila* pecanex and frizzled proteins, LIV-1
protein, NF2 protein, and GNS1/SUR4 eukaryotic integral membrane proteins. TM proteins also act
as transporters of ions or metabolites, such as gap junction channels (connexins) and ion channels,
and as cell anchoring proteins, such as lectins, integrins, and fibronectins. TM proteins act as vesicle
30 organelle-forming molecules, such as calveolins, or as cell recognition molecules, such as cluster of
differentiation (CD) antigens, glycoproteins, and mucins.

Many membrane proteins (MPs) contain amino acid sequence motifs that target these
proteins to specific subcellular sites. Examples of these motifs include PDZ domains, KDEL, RGD,
NGR, and GSL sequence motifs, von Willebrand factor A (vWFA) domains, and EGF-like domains.
35 RGD, NGR, and GSL motif-containing peptides have been used as drug delivery agents in cancer

treatments which target tumor vasculature (Arap, W. et al. (1998) Science, 279:377-380).

Furthermore, MPs may also contain amino acid sequence motifs, such as the carbohydrate recognition domain (CRD), also known as the C-type lectin domain, that mediate interactions with extracellular or intracellular molecules.

5 Membrane proteins may also interact with and regulate the properties of the membrane lipids. Phospholipid scramblase, a type II plasma membrane protein, mediates calcium dependent movement of phospholipids (PL) between membrane leaflets. Calcium induced remodeling of plasma membrane PL plays a key role in expression of platelet anticoagulant activity and in clearance of injured or apoptotic cells (Zhou Q. et al. (1997) J. Biol. Chem. 272:18240-18244). Scott syndrome, a
10 bleeding disorder, is caused by an inherited deficiency in plasma membrane PL scramblase function (Online Mendelian Inheritance in Man (OMIM) *262890 Platelet Receptor for Factor X, Deficiency of).

Chemical modification of amino acid residue side chains alters the manner in which MPs interact with other molecules, such as phospholipid membranes. Examples of such chemical
15 modifications to amino acid residue side chains are covalent bond formation with glycosaminoglycans, oligosaccharides, phospholipids, acetyl and palmitoyl moieties, ADP-ribose, phosphate, and sulphate groups.

One function of TM proteins is to facilitate cell-cell communication. The slit proteins are extracellular matrix proteins expressed by cells at the ventral midline of the nervous system. Slit
20 proteins are ligands for the repulsive guidance receptor Robo and thus play a role in repulsive axon guidance (Brose, K. et al. (1999) Cell 96:795-806).

In some cases TM proteins serve as transporters or channels in the cell membrane. For example, the mouse transporter protein (MTP) has four transmembrane domains and resides in an intracellular membrane compartment. MTP can mediate transport of nucleosides in vitro. The role
25 of MTP in the cell may therefore be to transfer nucleosides between the cytosol and the lumen of intracellular organelles (Hogue, D. L. (1996) J. Biol. Chem. 271:9801-9808). The human stomatin-like protein (hSLP-1), expressed primarily in the brain, contains an N-terminal domain similar to the erythrocyte internal membrane protein stomatin, as well as a non-specific lipid transfer protein domain at the C-terminus. hSLP-1 is the human homologue of the C. elegans behavioral gene unc-
30 24, which is believed to be involved in lipid transfer between closely apposed membranes (Seidel, G. and Prohaska, R (1998) Gene 225:23-29).

The transmembrane 4 superfamily (TM4SF) or tetraspan family is a multigene family encoding type III integral membrane proteins (Wright, M.D. and Tomlinson, M.G. (1994) Immunol. Today 15:588-594). TM4SF is comprised of membrane proteins which traverse the cell membrane
35 four times. Members of the TM4SF include platelet and endothelial cell membrane proteins,

melanoma-associated antigens, leukocyte surface glycoproteins, colonal carcinoma antigens, tumor-associated antigens, and surface proteins of the schistosome parasites (Jankowski, S.A. (1994) *Oncogene* 9:1205-1211). Members of the TM4SF share about 25-30% amino acid sequence identity with one another.

5 A number of TM4SF members have been implicated in signal transduction, control of cell adhesion, regulation of cell growth and proliferation, including development and oncogenesis, and cell motility, including tumor cell metastasis. Expression of TM4SF proteins is associated with a variety of tumors and the level of expression may be altered when cells are growing or activated.

 Tumor antigens are cell surface molecules that are differentially expressed in tumor cells
10 relative to normal cells. Tumor antigens distinguish tumor cells immunologically from normal cells and provide diagnostic and therapeutic targets for human cancers (Takagi, S. et al. (1995) *Int. J. Cancer* 61: 706-715; Liu, E. et al. (1992) *Oncogene* 7: 1027-1032). For example, the biliary glycoprotein-encoding gene is a member of the human carcinoembryonic antigen family, which are important tumor markers for colorectal carcinomas (Hammarstrom, S. (1999) *Semin. Cancer Bio.*
15 9:67-81). Another example is the neuron and testis specific protein Ma1, a marker for paraneoplastic neuronal disorders (Dalmau, J. et al. (1999) *Brain* 122:27-39).

 Other types of cell surface antigens include those identified on leukocytic cells of the immune system. These antigens have been identified using systematic, monoclonal antibody (mAb)-based "shot gun" techniques. These techniques have resulted in the production of hundreds of mAbs
20 directed against unknown cell surface leukocytic antigens. These antigens have been grouped into "clusters of differentiation" based on common immunocytochemical localization patterns in various differentiated and undifferentiated leukocytic cell types. Antigens in a given cluster are presumed to identify a single cell surface protein and are assigned a "cluster of differentiation" or "CD" designation. Some of the genes encoding proteins identified by CD antigens have been cloned and
25 verified by standard molecular biology techniques. CD antigens have been characterized as both transmembrane proteins and cell surface proteins anchored to the plasma membrane via covalent attachment to fatty acid-containing glycolipids such as glycosylphosphatidylinositol (GPI). (Reviewed in Barclay, A. N. et al. (1995) The Leucocyte Antigen Facts Book, Academic Press, San Diego, CA, pp. 17-20.)

30 The TM cell surface glycoprotein CD69 is an early activation antigen of T lymphocytes. CD69 is homologous to members of a supergene family of type II integral membrane proteins having C-type lectin domains. Although the precise functions of the CD-69 antigen is not known, evidence suggests that these proteins transmit mitogenic signals across the plasma membrane and are up-regulated in response to lymphocyte activation (Hamann, J. et. al. (1993) *J. Immunol.* 150:4920-
35 4927).

Macrophages are involved in functions including clearance of senescent or apoptotic cells, cytokine production, hemopoiesis, bone resorption, antigen transport, and neuroendocrine regulation. These diverse roles are influenced by specialized macrophage plasma membrane proteins. The murine macrophage restricted C-type lectin is a type II integral membrane protein expressed
5 exclusively in macrophages. The strong expression of this protein in bone marrow suggests a hemopoietic function, while the lectin domain suggests it may be involved in cell-cell recognition (Balch, S. G. et al. (1998) J. Biol. Chem. 273:18656-18664).

The surface of red blood cells is populated with characteristic glycoproteins, such as the major sialoglycoproteins glyophorin A and B. Red blood cells lacking either glyophorin A or B are
10 resistant to infection with the malaria parasite *Plasmodium falciparum* (OMIM Entry 111300 Blood Group-MN Locus). White blood cells also possess characteristic surface glycoproteins, such as the plasma cell glycoprotein-1 (PC-1). PC-1 is expressed on the surface of plasma cells, which are terminally differentiated, antibody-secreting B-lymphocytes. The extracellular domain of PC-1 has nucleotide phosphodiesterase (pyrophosphatase) activity (Funakoshi, I. et al. (1992) Arch. Biochem.
15 Biophys. 295:180-187). Phosphodiesterase activity is associated with the hydrolytic removal of nucleotide subunits from oligonucleotides. Although the precise physiological role of PC-1 is not clear, increased PC-1 phosphodiesterase activity has been correlated with insulin resistance in patients with noninsulin-dependent diabetes mellitus, with abnormalities of bone mineralization and calcification, and with defects in renal tubule function. In addition, it appears that hPC-1 and mPC-1
20 are members of a multigene family of transmembrane phosphodiesterases with extracellular active sites. These enzymes may play a role in regulating the concentration of pharmacologically active extracellular compounds such as adenosine or other nucleotide derivatives in a variety of tissues and cell types. (Reviewed in Goding, J. W. et al. (1998) Immunol. Rev. 161:11-26.)

25 Peripheral and Anchored Membrane Proteins

Some membrane proteins are not membrane-spanning but are attached to the plasma membrane via membrane anchors or interactions with integral membrane proteins. Membrane anchors are covalently joined to a protein post-translationally and include such moieties as prenyl, myristyl, and glycosylphosphatidyl inositol (GPI) groups. Membrane localization of peripheral and
30 anchored proteins is important for their function in processes such as receptor-mediated signal transduction. For example, prenylation of Ras is required for its localization to the plasma membrane and for its normal and oncogenic functions in signal transduction.

The pancortins are a group of four glycoproteins which are predominantly expressed in the cerebral cortex of adult rodents. Immunological localization indicates that the pancortins are
35 endoplasmic reticulum anchored proteins. The pancortins share a common sequence in the middle of

their structure, but have alternative sequences at both ends due to differential promoter usage and alternative splicing. Each pancortin appears to be differentially expressed and may perform different functions in the brain (Nagano, T. et al. (1998) Mol. Brain Res. 53:13-23).

The discovery of new membrane associated proteins and the polynucleotides encoding them
5 satisfies a need in the art by providing new compositions which are useful in the diagnosis, prevention, and treatment of cell proliferative, autoimmune/inflammatory, neurological and gastrointestinal disorders.

SUMMARY OF THE INVENTION

10 The invention features purified polypeptides, membrane associated proteins, referred to collectively as "MEMAP" and individually as "MEMAP-1," "MEMAP-2," "MEMAP-3," "MEMAP-4," "MEMAP-5," "MEMAP-6," "MEMAP-7," "MEMAP-8," "MEMAP-9," "MEMAP-10," "MEMAP-11," "MEMAP-12," "MEMAP-13," "MEMAP-14," "MEMAP-15," "MEMAP-16," "MEMAP-17," "MEMAP-18," "MEMAP-19," "MEMAP-20," "MEMAP-21," "MEMAP-22,"
15 "MEMAP-23," "MEMAP-24," "MEMAP-25," "MEMAP-26," "MEMAP-27," "MEMAP-28," "MEMAP-29," "MEMAP-30," "MEMAP-31," "MEMAP-32," "MEMAP-33," "MEMAP-34," "MEMAP-35," "MEMAP-36," and "MEMAP-37." In one aspect, the invention provides an isolated polypeptide comprising an amino acid sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino
20 acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. In one alternative, the invention provides an isolated polypeptide comprising the amino acid sequence of SEQ ID NO:1-37.

25 The invention further provides an isolated polynucleotide encoding a polypeptide comprising an amino acid sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group
30 consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. In one alternative, the polynucleotide encodes a polypeptide selected from the group consisting of SEQ ID NO:1-37. In another alternative, the polynucleotide is selected from the group consisting of SEQ ID NO:38-74.

Additionally, the invention provides a recombinant polynucleotide comprising a promoter
35 sequence operably linked to a polynucleotide encoding a polypeptide comprising an amino acid

sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of
5 SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. In one alternative, the invention provides a cell transformed with the recombinant polynucleotide. In another alternative, the invention provides a transgenic organism comprising the recombinant polynucleotide.

The invention also provides a method for producing a polypeptide comprising an amino acid
10 sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of
15 SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. The method comprises a) culturing a cell under conditions suitable for expression of the polypeptide, wherein said cell is transformed with a recombinant polynucleotide comprising a promoter sequence operably linked to a polynucleotide encoding the polypeptide, and b) recovering the polypeptide so expressed.

Additionally, the invention provides an isolated antibody which specifically binds to a
20 polypeptide comprising an amino acid sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino
25 acid sequence selected from the group consisting of SEQ ID NO:1-37.

The invention further provides an isolated polynucleotide comprising a polynucleotide sequence selected from the group consisting of a) a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, b) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID
30 NO:38-74, c) a polynucleotide sequence complementary to a), d) a polynucleotide sequence complementary to b), and e) an RNA equivalent of a)-d). In one alternative, the polynucleotide comprises at least 60 contiguous nucleotides.

Additionally, the invention provides a method for detecting a target polynucleotide in a sample, said target polynucleotide having a sequence of a polynucleotide comprising a polynucleotide
35 sequence selected from the group consisting of a) a polynucleotide sequence selected from the group

consisting of SEQ ID NO:38-74, b) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, c) a polynucleotide sequence complementary to a), d) a polynucleotide sequence complementary to b), and e) an RNA equivalent of a)-d). The method comprises a) hybridizing the sample with a probe comprising at least 20 contiguous nucleotides comprising a sequence complementary to said target polynucleotide in the sample, and which probe specifically hybridizes to said target polynucleotide, under conditions whereby a hybridization complex is formed between said probe and said target polynucleotide or fragments thereof, and b) detecting the presence or absence of said hybridization complex, and optionally, if present, the amount thereof. In one alternative, the probe comprises at least 60 contiguous nucleotides.

The invention further provides a method for detecting a target polynucleotide in a sample, said target polynucleotide having a sequence of a polynucleotide comprising a polynucleotide sequence selected from the group consisting of a) a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, b) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, c) a polynucleotide sequence complementary to a), d) a polynucleotide sequence complementary to b), and e) an RNA equivalent of a)-d). The method comprises a) amplifying said target polynucleotide or fragment thereof using polymerase chain reaction amplification, and b) detecting the presence or absence of said amplified target polynucleotide or fragment thereof, and, optionally, if present, the amount thereof.

The invention further provides a composition comprising an effective amount of a polypeptide comprising an amino acid sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and a pharmaceutically acceptable excipient. In one embodiment, the composition comprises an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. The invention additionally provides a method of treating a disease or condition associated with decreased expression of functional MEMAP, comprising administering to a patient in need of such treatment the composition.

The invention also provides a method for screening a compound for effectiveness as an agonist of a polypeptide comprising an amino acid sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence

selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. The method comprises a) exposing a sample comprising the polypeptide to a compound, and b) detecting
5 agonist activity in the sample. In one alternative, the invention provides a composition comprising an agonist compound identified by the method and a pharmaceutically acceptable excipient. In another alternative, the invention provides a method of treating a disease or condition associated with decreased expression of functional MEMAP, comprising administering to a patient in need of such treatment the composition.

10 Additionally, the invention provides a method for screening a compound for effectiveness as an antagonist of a polypeptide comprising an amino acid sequence selected from the group consisting of a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence
15 acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. The method comprises a) exposing a sample comprising the polypeptide to a compound, and b) detecting antagonist activity in the sample. In one alternative, the invention provides a composition comprising an antagonist compound identified by the method and a pharmaceutically acceptable excipient. In
20 another alternative, the invention provides a method of treating a disease or condition associated with overexpression of functional MEMAP, comprising administering to a patient in need of such treatment the composition.

The invention further provides a method of screening for a compound that specifically binds to a polypeptide comprising an amino acid sequence selected from the group consisting of a) an
25 amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. The method comprises a)
30 combining the polypeptide with at least one test compound under suitable conditions, and b) detecting binding of the polypeptide to the test compound, thereby identifying a compound that specifically binds to the polypeptide.

The invention further provides a method of screening for a compound that modulates the activity of a polypeptide comprising an amino acid sequence selected from the group consisting of a)
35 an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, b) a naturally

occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37, and d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-37. The

5 method comprises a) combining the polypeptide with at least one test compound under conditions permissive for the activity of the polypeptide, b) assessing the activity of the polypeptide in the presence of the test compound, and c) comparing the activity of the polypeptide in the presence of the test compound with the activity of the polypeptide in the absence of the test compound, wherein a change in the activity of the polypeptide in the presence of the test compound is indicative of a

10 compound that modulates the activity of the polypeptide.

The invention further provides a method for screening a compound for effectiveness in altering expression of a target polynucleotide, wherein said target polynucleotide comprises a sequence selected from the group consisting of SEQ ID NO:38-74, the method comprising a) exposing a sample comprising the target polynucleotide to a compound, and b) detecting altered

15 expression of the target polynucleotide.

The invention further provides a method for assessing toxicity of a test compound, said method comprising a) treating a biological sample containing nucleic acids with the test compound; b) hybridizing the nucleic acids of the treated biological sample with a probe comprising at least 20 contiguous nucleotides of a polynucleotide comprising a polynucleotide sequence selected from the

20 group consisting of i) a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, ii) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, iii) a polynucleotide sequence complementary to i), iv) a polynucleotide sequence complementary to ii), and v) an RNA equivalent of i)-iv). Hybridization occurs under conditions whereby a specific

25 hybridization complex is formed between said probe and a target polynucleotide in the biological sample, said target polynucleotide comprising a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, ii) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:38-74, iii) a polynucleotide sequence complementary to i), iv) a polynucleotide sequence

30 complementary to ii), and v) an RNA equivalent of i)-iv). Alternatively, the target polynucleotide comprises a fragment of the above polynucleotide sequence; c) quantifying the amount of hybridization complex; and d) comparing the amount of hybridization complex in the treated biological sample with the amount of hybridization complex in an untreated biological sample, wherein a difference in the amount of hybridization complex in the treated biological sample is

35 indicative of toxicity of the test compound.

BRIEF DESCRIPTION OF THE TABLES

Table 1 shows polypeptide and nucleotide sequence identification numbers (SEQ ID NOs), clone identification numbers (clone IDs), cDNA libraries, and cDNA fragments used to assemble full-length sequences encoding MEMAP.

Table 2 shows features of each polypeptide sequence, including potential motifs, homologous sequences, and methods, algorithms, and searchable databases used for analysis of MEMAP.

Table 3 shows selected fragments of each nucleic acid sequence; the tissue-specific expression patterns of each nucleic acid sequence as determined by northern analysis; diseases, disorders, or conditions associated with these tissues; and the vector into which each cDNA was cloned.

Table 4 describes the tissues used to construct the cDNA libraries from which cDNA clones encoding MEMAP were isolated.

Table 5 shows the tools, programs, and algorithms used to analyze the polynucleotides and polypeptides of the invention, along with applicable descriptions, references, and threshold parameters.

DESCRIPTION OF THE INVENTION

Before the present proteins, nucleotide sequences, and methods are described, it is understood that this invention is not limited to the particular machines, materials and methods described, as these may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention which will be limited only by the appended claims.

It must be noted that as used herein and in the appended claims, the singular forms "a," "an," and "the" include plural reference unless the context clearly dictates otherwise. Thus, for example, a reference to "a host cell" includes a plurality of such host cells, and a reference to "an antibody" is a reference to one or more antibodies and equivalents thereof known to those skilled in the art, and so forth.

Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any machines, materials, and methods similar or equivalent to those described herein can be used to practice or test the present invention, the preferred machines, materials and methods are now described. All publications mentioned herein are cited for the purpose of describing and disclosing the cell lines, protocols, reagents and vectors which are reported in the publications and which might be used in connection with the invention. Nothing herein is to be construed as an admission that the

invention is not entitled to antedate such disclosure by virtue of prior invention.

DEFINITIONS

“MEMAP” refers to the amino acid sequences of substantially purified MEMAP obtained from any species, particularly a mammalian species, including bovine, ovine, porcine, murine, equine, and human, and from any source, whether natural, synthetic, semi-synthetic, or recombinant.

The term “agonist” refers to a molecule which intensifies or mimics the biological activity of MEMAP. Agonists may include proteins, nucleic acids, carbohydrates, small molecules, or any other compound or composition which modulates the activity of MEMAP either by directly interacting with MEMAP or by acting on components of the biological pathway in which MEMAP participates.

An “allelic variant” is an alternative form of the gene encoding MEMAP. Allelic variants may result from at least one mutation in the nucleic acid sequence and may result in altered mRNAs or in polypeptides whose structure or function may or may not be altered. A gene may have none, one, or many allelic variants of its naturally occurring form. Common mutational changes which give rise to allelic variants are generally ascribed to natural deletions, additions, or substitutions of nucleotides. Each of these types of changes may occur alone, or in combination with the others, one or more times in a given sequence.

“Altered” nucleic acid sequences encoding MEMAP include those sequences with deletions, insertions, or substitutions of different nucleotides, resulting in a polypeptide the same as MEMAP or a polypeptide with at least one functional characteristic of MEMAP. Included within this definition are polymorphisms which may or may not be readily detectable using a particular oligonucleotide probe of the polynucleotide encoding MEMAP, and improper or unexpected hybridization to allelic variants, with a locus other than the normal chromosomal locus for the polynucleotide sequence encoding MEMAP. The encoded protein may also be “altered,” and may contain deletions, insertions, or substitutions of amino acid residues which produce a silent change and result in a functionally equivalent MEMAP. Deliberate amino acid substitutions may be made on the basis of similarity in polarity, charge, solubility, hydrophobicity, hydrophilicity, and/or the amphipathic nature of the residues, as long as the biological or immunological activity of MEMAP is retained. For example, negatively charged amino acids may include aspartic acid and glutamic acid, and positively charged amino acids may include lysine and arginine. Amino acids with uncharged polar side chains having similar hydrophilicity values may include: asparagine and glutamine; and serine and threonine. Amino acids with uncharged side chains having similar hydrophilicity values may include: leucine, isoleucine, and valine; glycine and alanine; and phenylalanine and tyrosine.

The terms “amino acid” and “amino acid sequence” refer to an oligopeptide, peptide, polypeptide, or protein sequence, or a fragment of any of these, and to naturally occurring or synthetic molecules. Where “amino acid sequence” is recited to refer to a sequence of a naturally occurring

protein molecule, "amino acid sequence" and like terms are not meant to limit the amino acid sequence to the complete native amino acid sequence associated with the recited protein molecule.

"Amplification" relates to the production of additional copies of a nucleic acid sequence. Amplification is generally carried out using polymerase chain reaction (PCR) technologies well known in the art.

The term "antagonist" refers to a molecule which inhibits or attenuates the biological activity of MEMAP. Antagonists may include proteins such as antibodies, nucleic acids, carbohydrates, small molecules, or any other compound or composition which modulates the activity of MEMAP either by directly interacting with MEMAP or by acting on components of the biological pathway in which MEMAP participates.

The term "antibody" refers to intact immunoglobulin molecules as well as to fragments thereof, such as Fab, F(ab')₂, and Fv fragments, which are capable of binding an epitopic determinant. Antibodies that bind MEMAP polypeptides can be prepared using intact polypeptides or using fragments containing small peptides of interest as the immunizing antigen. The polypeptide or oligopeptide used to immunize an animal (e.g., a mouse, a rat, or a rabbit) can be derived from the translation of RNA, or synthesized chemically, and can be conjugated to a carrier protein if desired. Commonly used carriers that are chemically coupled to peptides include bovine serum albumin, thyroglobulin, and keyhole limpet hemocyanin (KLH). The coupled peptide is then used to immunize the animal.

The term "antigenic determinant" refers to that region of a molecule (i.e., an epitope) that makes contact with a particular antibody. When a protein or a fragment of a protein is used to immunize a host animal, numerous regions of the protein may induce the production of antibodies which bind specifically to antigenic determinants (particular regions or three-dimensional structures on the protein). An antigenic determinant may compete with the intact antigen (i.e., the immunogen used to elicit the immune response) for binding to an antibody.

The term "antisense" refers to any composition capable of base-pairing with the "sense" (coding) strand of a specific nucleic acid sequence. Antisense compositions may include DNA; RNA; peptide nucleic acid (PNA); oligonucleotides having modified backbone linkages such as phosphorothioates, methylphosphonates, or benzylphosphonates; oligonucleotides having modified sugar groups such as 2'-methoxyethyl sugars or 2'-methoxyethoxy sugars; or oligonucleotides having modified bases such as 5-methyl cytosine, 2'-deoxyuracil, or 7-deaza-2'-deoxyguanosine. Antisense molecules may be produced by any method including chemical synthesis or transcription. Once introduced into a cell, the complementary antisense molecule base-pairs with a naturally occurring nucleic acid sequence produced by the cell to form duplexes which block either transcription or translation. The designation "negative" or "minus" can refer to the antisense strand, and the

designation "positive" or "plus" can refer to the sense strand of a reference DNA molecule.

The term "biologically active" refers to a protein having structural, regulatory, or biochemical functions of a naturally occurring molecule. Likewise, "immunologically active" or "immunogenic" refers to the capability of the natural, recombinant, or synthetic MEMAP, or of any oligopeptide thereof, to induce a specific immune response in appropriate animals or cells and to bind with specific antibodies.

"Complementary" describes the relationship between two single-stranded nucleic acid sequences that anneal by base-pairing. For example, 5'-AGT-3' pairs with its complement, 3'-TCA-5'.

A "composition comprising a given polynucleotide sequence" and a "composition comprising a given amino acid sequence" refer broadly to any composition containing the given polynucleotide or amino acid sequence. The composition may comprise a dry formulation or an aqueous solution. Compositions comprising polynucleotide sequences encoding MEMAP or fragments of MEMAP may be employed as hybridization probes. The probes may be stored in freeze-dried form and may be associated with a stabilizing agent such as a carbohydrate. In hybridizations, the probe may be deployed in an aqueous solution containing salts (e.g., NaCl), detergents (e.g., sodium dodecyl sulfate; SDS), and other components (e.g., Denhardt's solution, dry milk, salmon sperm DNA, etc.).

"Consensus sequence" refers to a nucleic acid sequence which has been subjected to repeated DNA sequence analysis to resolve uncalled bases, extended using the XL-PCR kit (PE Biosystems, Foster City CA) in the 5' and/or the 3' direction, and resequenced, or which has been assembled from one or more overlapping cDNA, EST, or genomic DNA fragments using a computer program for fragment assembly, such as the GELVIEW fragment assembly system (GCG, Madison WI) or Phrap (University of Washington, Seattle WA). Some sequences have been both extended and assembled to produce the consensus sequence.

"Conservative amino acid substitutions" are those substitutions that are predicted to least interfere with the properties of the original protein, i.e., the structure and especially the function of the protein is conserved and not significantly changed by such substitutions. The table below shows amino acids which may be substituted for an original amino acid in a protein and which are regarded as conservative amino acid substitutions.

| 30 | Original Residue | Conservative Substitution |
|----|------------------|---------------------------|
| | Ala | Gly, Ser |
| | Arg | His, Lys |
| | Asn | Asp, Gln, His |
| | Asp | Asn, Glu |
| 35 | Cys | Ala, Ser |
| | Gln | Asn, Glu, His |
| | Glu | Asp, Gln, His |

| | | |
|----|-----|-------------------------|
| | Gly | Ala |
| | His | Asn, Arg, Gln, Glu |
| | Ile | Leu, Val |
| 5 | Leu | Ile, Val |
| | Lys | Arg, Gln, Glu |
| | Met | Leu, Ile |
| | Phe | His, Met, Leu, Trp, Tyr |
| | Ser | Cys, Thr |
| | Thr | Ser, Val |
| 10 | Trp | Phe, Tyr |
| | Tyr | His, Phe, Trp |
| | Val | Ile, Leu, Thr |

Conservative amino acid substitutions generally maintain (a) the structure of the polypeptide backbone in the area of the substitution, for example, as a beta sheet or alpha helical conformation, (b) the charge or hydrophobicity of the molecule at the site of the substitution, and/or (c) the bulk of the side chain.

A "deletion" refers to a change in the amino acid or nucleotide sequence that results in the absence of one or more amino acid residues or nucleotides.

The term "derivative" refers to a chemically modified polynucleotide or polypeptide. Chemical modifications of a polynucleotide sequence can include, for example, replacement of hydrogen by an alkyl, acyl, hydroxyl, or amino group. A derivative polynucleotide encodes a polypeptide which retains at least one biological or immunological function of the natural molecule. A derivative polypeptide is one modified by glycosylation, pegylation, or any similar process that retains at least one biological or immunological function of the polypeptide from which it was derived.

A "detectable label" refers to a reporter molecule or enzyme that is capable of generating a measurable signal and is covalently or noncovalently joined to a polynucleotide or polypeptide.

A "fragment" is a unique portion of MEMAP or the polynucleotide encoding MEMAP which is identical in sequence to but shorter in length than the parent sequence. A fragment may comprise up to the entire length of the defined sequence, minus one nucleotide/amino acid residue. For example, a fragment may comprise from 5 to 1000 contiguous nucleotides or amino acid residues. A fragment used as a probe, primer, antigen, therapeutic molecule, or for other purposes, may be at least 5, 10, 15, 16, 20, 25, 30, 40, 50, 60, 75, 100, 150, 250 or at least 500 contiguous nucleotides or amino acid residues in length. Fragments may be preferentially selected from certain regions of a molecule. For example, a polypeptide fragment may comprise a certain length of contiguous amino acids selected from the first 250 or 500 amino acids (or first 25% or 50% of a polypeptide) as shown in a certain defined sequence. Clearly these lengths are exemplary, and any length that is supported by the specification, including the Sequence Listing, tables, and figures, may be encompassed by the

present embodiments.

A fragment of SEQ ID NO:38-74 comprises a region of unique polynucleotide sequence that specifically identifies SEQ ID NO:38-74, for example, as distinct from any other sequence in the genome from which the fragment was obtained. A fragment of SEQ ID NO:38-74 is useful, for example, in hybridization and amplification technologies and in analogous methods that distinguish SEQ ID NO:38-74 from related polynucleotide sequences. The precise length of a fragment of SEQ ID NO:38-74 and the region of SEQ ID NO:38-74 to which the fragment corresponds are routinely determinable by one of ordinary skill in the art based on the intended purpose for the fragment.

A fragment of SEQ ID NO:1-37 is encoded by a fragment of SEQ ID NO:38-74. A fragment of SEQ ID NO:1-37 comprises a region of unique amino acid sequence that specifically identifies SEQ ID NO:1-37. For example, a fragment of SEQ ID NO:1-37 is useful as an immunogenic peptide for the development of antibodies that specifically recognize SEQ ID NO:1-37. The precise length of a fragment of SEQ ID NO:1-37 and the region of SEQ ID NO:1-37 to which the fragment corresponds are routinely determinable by one of ordinary skill in the art based on the intended purpose for the fragment.

A "full-length" polynucleotide sequence is one containing at least a translation initiation codon (e.g., methionine) followed by an open reading frame and a translation termination codon. A "full-length" polynucleotide sequence encodes a "full-length" polypeptide sequence.

"Homology" refers to sequence similarity or, interchangeably, sequence identity, between two or more polynucleotide sequences or two or more polypeptide sequences.

The terms "percent identity" and "% identity," as applied to polynucleotide sequences, refer to the percentage of residue matches between at least two polynucleotide sequences aligned using a standardized algorithm. Such an algorithm may insert, in a standardized and reproducible way, gaps in the sequences being compared in order to optimize alignment between two sequences, and therefore achieve a more meaningful comparison of the two sequences.

Percent identity between polynucleotide sequences may be determined using the default parameters of the CLUSTAL V algorithm as incorporated into the MEGALIGN version 3.12e sequence alignment program. This program is part of the LASERGENE software package, a suite of molecular biological analysis programs (DNASTAR, Madison WI). CLUSTAL V is described in Higgins, D.G. and P.M. Sharp (1989) CABIOS 5:151-153 and in Higgins, D.G. et al. (1992) CABIOS 8:189-191. For pairwise alignments of polynucleotide sequences, the default parameters are set as follows: Ktuple=2, gap penalty=5, window=4, and "diagonals saved"=4. The "weighted" residue weight table is selected as the default. Percent identity is reported by CLUSTAL V as the "percent similarity" between aligned polynucleotide sequences.

Alternatively, a suite of commonly used and freely available sequence comparison algorithms

is provided by the National Center for Biotechnology Information (NCBI) Basic Local Alignment Search Tool (BLAST) (Altschul, S.F. et al. (1990) J. Mol. Biol. 215:403-410), which is available from several sources, including the NCBI, Bethesda, MD, and on the Internet at

<http://www.ncbi.nlm.nih.gov/BLAST/>. The BLAST software suite includes various sequence

- 5 analysis programs including "blastn," that is used to align a known polynucleotide sequence with other polynucleotide sequences from a variety of databases. Also available is a tool called "BLAST 2 Sequences" that is used for direct pairwise comparison of two nucleotide sequences. "BLAST 2 Sequences" can be accessed and used interactively at <http://www.ncbi.nlm.nih.gov/gorf/bl2.html>. The "BLAST 2 Sequences" tool can be used for both blastn and blastp (discussed below). BLAST
- 10 programs are commonly used with gap and other parameters set to default settings. For example, to compare two nucleotide sequences, one may use blastn with the "BLAST 2 Sequences" tool Version 2.0.12 (April-21-2000) set at default parameters. Such default parameters may be, for example:

Matrix: BLOSUM62

Reward for match: 1

- 15 *Penalty for mismatch: -2*

Open Gap: 5 and Extension Gap: 2 penalties

Gap x drop-off: 50

Expect: 10

Word Size: 11

- 20 *Filter: on*

Percent identity may be measured over the length of an entire defined sequence, for example, as defined by a particular SEQ ID number, or may be measured over a shorter length, for example, over the length of a fragment taken from a larger, defined sequence, for instance, a fragment of at least 20, at least 30, at least 40, at least 50, at least 70, at least 100, or at least 200 contiguous

25 nucleotides. Such lengths are exemplary only, and it is understood that any fragment length supported by the sequences shown herein, in the tables, figures, or Sequence Listing, may be used to describe a length over which percentage identity may be measured.

- 30 Nucleic acid sequences that do not show a high degree of identity may nevertheless encode similar amino acid sequences due to the degeneracy of the genetic code. It is understood that changes in a nucleic acid sequence can be made using this degeneracy to produce multiple nucleic acid sequences that all encode substantially the same protein.

- 35 The phrases "percent identity" and "% identity," as applied to polypeptide sequences, refer to the percentage of residue matches between at least two polypeptide sequences aligned using a standardized algorithm. Methods of polypeptide sequence alignment are well-known. Some alignment methods take into account conservative amino acid substitutions. Such conservative

substitutions, explained in more detail above, generally preserve the charge and hydrophobicity at the site of substitution, thus preserving the structure (and therefore function) of the polypeptide.

Percent identity between polypeptide sequences may be determined using the default parameters of the CLUSTAL V algorithm as incorporated into the MEGALIGN version 3.12e sequence alignment program (described and referenced above). For pairwise alignments of polypeptide sequences using CLUSTAL V, the default parameters are set as follows: Ktuple=1, gap penalty=3, window=5, and "diagonals saved"=5. The PAM250 matrix is selected as the default residue weight table. As with polynucleotide alignments, the percent identity is reported by CLUSTAL V as the "percent similarity" between aligned polypeptide sequence pairs.

Alternatively the NCBI BLAST software suite may be used. For example, for a pairwise comparison of two polypeptide sequences, one may use the "BLAST 2 Sequences" tool Version 2.0.12 (Apr-21-2000) with blastp set at default parameters. Such default parameters may be, for example:

Matrix: BLOSUM62
Open Gap: 11 and Extension Gap: 1 penalties
Gap x drop-off: 50
Expect: 10
Word Size: 3
Filter: on

Percent identity may be measured over the length of an entire defined polypeptide sequence, for example, as defined by a particular SEQ ID number, or may be measured over a shorter length, for example, over the length of a fragment taken from a larger, defined polypeptide sequence, for instance, a fragment of at least 15, at least 20, at least 30, at least 40, at least 50, at least 70 or at least 150 contiguous residues. Such lengths are exemplary only, and it is understood that any fragment length supported by the sequences shown herein, in the tables, figures or Sequence Listing, may be used to describe a length over which percentage identity may be measured.

"Human artificial chromosomes" (HACs) are linear microchromosomes which may contain DNA sequences of about 6 kb to 10 Mb in size, and which contain all of the elements required for chromosome replication, segregation and maintenance.

The term "humanized antibody" refers to an antibody molecule in which the amino acid sequence in the non-antigen binding regions has been altered so that the antibody more closely resembles a human antibody, and still retains its original binding ability.

"Hybridization" refers to the process by which a polynucleotide strand anneals with a complementary strand through base pairing under defined hybridization conditions. Specific hybridization is an indication that two nucleic acid sequences share a high degree of complementarity.

Specific hybridization complexes form under permissive annealing conditions and remain hybridized after the "washing" step(s). The washing step(s) is particularly important in determining the stringency of the hybridization process, with more stringent conditions allowing less non-specific binding, i.e., binding between pairs of nucleic acid strands that are not perfectly matched. Permissive conditions for annealing of nucleic acid sequences are routinely determinable by one of ordinary skill
5 in the art and may be consistent among hybridization experiments, whereas wash conditions may be varied among experiments to achieve the desired stringency, and therefore hybridization specificity. Permissive annealing conditions occur, for example, at 68°C in the presence of about 6 x SSC, about 1% (w/v) SDS, and about 100 µg/ml sheared, denatured salmon sperm DNA.

10 Generally, stringency of hybridization is expressed, in part, with reference to the temperature under which the wash step is carried out. Such wash temperatures are typically selected to be about 5°C to 20°C lower than the thermal melting point (T_m) for the specific sequence at a defined ionic strength and pH. The T_m is the temperature (under defined ionic strength and pH) at which 50% of the target sequence hybridizes to a perfectly matched probe. An equation for calculating T_m and
15 conditions for nucleic acid hybridization are well known and can be found in Sambrook, J. et al., 1989, Molecular Cloning: A Laboratory Manual, 2nd ed., vol. 1-3, Cold Spring Harbor Press, Plainview NY; specifically see volume 2, chapter 9.

High stringency conditions for hybridization between polynucleotides of the present invention include wash conditions of 68°C in the presence of about 0.2 x SSC and about 0.1% SDS,
20 for 1 hour. Alternatively, temperatures of about 65°C, 60°C, 55°C, or 42°C may be used. SSC concentration may be varied from about 0.1 to 2 x SSC, with SDS being present at about 0.1%. Typically, blocking reagents are used to block non-specific hybridization. Such blocking reagents include, for instance, sheared and denatured salmon sperm DNA at about 100-200 µg/ml. Organic solvent, such as formamide at a concentration of about 35-50% v/v, may also be used under particular
25 circumstances, such as for RNA:DNA hybridizations. Useful variations on these wash conditions will be readily apparent to those of ordinary skill in the art. Hybridization, particularly under high stringency conditions, may be suggestive of evolutionary similarity between the nucleotides. Such similarity is strongly indicative of a similar role for the nucleotides and their encoded polypeptides.

The term "hybridization complex" refers to a complex formed between two nucleic acid
30 sequences by virtue of the formation of hydrogen bonds between complementary bases. A hybridization complex may be formed in solution (e.g., C_0t or R_0t analysis) or formed between one nucleic acid sequence present in solution and another nucleic acid sequence immobilized on a solid support (e.g., paper, membranes, filters, chips, pins or glass slides, or any other appropriate substrate to which cells or their nucleic acids have been fixed).

35 The words "insertion" and "addition" refer to changes in an amino acid or nucleotide

sequence resulting in the addition of one or more amino acid residues or nucleotides, respectively.

“Immune response” can refer to conditions associated with inflammation, trauma, immune disorders, or infectious or genetic disease, etc. These conditions can be characterized by expression of various factors, e.g., cytokines, chemokines, and other signaling molecules, which may affect
5 cellular and systemic defense systems.

An “immunogenic fragment” is a polypeptide or oligopeptide fragment of MEMAP which is capable of eliciting an immune response when introduced into a living organism, for example, a mammal. The term “immunogenic fragment” also includes any polypeptide or oligopeptide fragment of MEMAP which is useful in any of the antibody production methods disclosed herein or known in
10 the art.

The term “microarray” refers to an arrangement of a plurality of polynucleotides, polypeptides, or other chemical compounds on a substrate.

The terms “element” and “array element” refer to a polynucleotide, polypeptide, or other chemical compound having a unique and defined position on a microarray.

15 The term “modulate” refers to a change in the activity of MEMAP. For example, modulation may cause an increase or a decrease in protein activity, binding characteristics, or any other biological, functional, or immunological properties of MEMAP.

The phrases “nucleic acid” and “nucleic acid sequence” refer to a nucleotide, oligonucleotide, polynucleotide, or any fragment thereof. These phrases also refer to DNA or RNA of genomic or
20 synthetic origin which may be single-stranded or double-stranded and may represent the sense or the antisense strand, to peptide nucleic acid (PNA), or to any DNA-like or RNA-like material.

“Operably linked” refers to the situation in which a first nucleic acid sequence is placed in a functional relationship with a second nucleic acid sequence. For instance, a promoter is operably linked to a coding sequence if the promoter affects the transcription or expression of the coding
25 sequence. Operably linked DNA sequences may be in close proximity or contiguous and, where necessary to join two protein coding regions, in the same reading frame.

“Peptide nucleic acid” (PNA) refers to an antisense molecule or anti-gene agent which comprises an oligonucleotide of at least about 5 nucleotides in length linked to a peptide backbone of amino acid residues ending in lysine. The terminal lysine confers solubility to the composition.
30 PNAs preferentially bind complementary single stranded DNA or RNA and stop transcript elongation, and may be pegylated to extend their lifespan in the cell.

“Post-translational modification” of an MEMAP may involve lipidation, glycosylation, phosphorylation, acetylation, racemization, proteolytic cleavage, and other modifications known in the art. These processes may occur synthetically or biochemically. Biochemical modifications will
35 vary by cell type depending on the enzymatic milieu of MEMAP.

"Probe" refers to nucleic acid sequences encoding MEMAP, their complements, or fragments thereof, which are used to detect identical, allelic or related nucleic acid sequences. Probes are isolated oligonucleotides or polynucleotides attached to a detectable label or reporter molecule. Typical labels include radioactive isotopes, ligands, chemiluminescent agents, and enzymes.

- 5 "Primers" are short nucleic acids, usually DNA oligonucleotides, which may be annealed to a target polynucleotide by complementary base-pairing. The primer may then be extended along the target DNA strand by a DNA polymerase enzyme. Primer pairs can be used for amplification (and identification) of a nucleic acid sequence, e.g., by the polymerase chain reaction (PCR).

Probes and primers as used in the present invention typically comprise at least 15 contiguous
10 nucleotides of a known sequence. In order to enhance specificity, longer probes and primers may also be employed, such as probes and primers that comprise at least 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, or at least 150 consecutive nucleotides of the disclosed nucleic acid sequences. Probes and primers may be considerably longer than these examples, and it is understood that any length supported by the specification, including the tables, figures, and Sequence Listing, may be used.

- 15 Methods for preparing and using probes and primers are described in the references, for example Sambrook, J. et al. (1989) Molecular Cloning: A Laboratory Manual, 2nd ed., vol. 1-3, Cold Spring Harbor Press, Plainview NY; Ausubel, F.M. et al. (1987) Current Protocols in Molecular Biology, Greene Publ. Assoc. & Wiley-Intersciences, New York NY; Innis, M. et al. (1990) PCR Protocols, A Guide to Methods and Applications, Academic Press, San Diego CA. PCR primer pairs
20 can be derived from a known sequence, for example, by using computer programs intended for that purpose such as Primer (Version 0.5, 1991, Whitehead Institute for Biomedical Research, Cambridge MA).

- Oligonucleotides for use as primers are selected using software known in the art for such purpose. For example, OLIGO 4.06 software is useful for the selection of PCR primer pairs of up to
25 100 nucleotides each, and for the analysis of oligonucleotides and larger polynucleotides of up to 5,000 nucleotides from an input polynucleotide sequence of up to 32 kilobases. Similar primer selection programs have incorporated additional features for expanded capabilities. For example, the PrimOU primer selection program (available to the public from the Genome Center at University of Texas South West Medical Center, Dallas TX) is capable of choosing specific primers from
30 megabase sequences and is thus useful for designing primers on a genome-wide scope. The Primer3 primer selection program (available to the public from the Whitehead Institute/MIT Center for Genome Research, Cambridge MA) allows the user to input a "mispriming library," in which sequences to avoid as primer binding sites are user-specified. Primer3 is useful, in particular, for the selection of oligonucleotides for microarrays. (The source code for the latter two primer selection
35 programs may also be obtained from their respective sources and modified to meet the user's specific

needs.) The PrimeGen program (available to the public from the UK Human Genome Mapping Project Resource Centre, Cambridge UK) designs primers based on multiple sequence alignments, thereby allowing selection of primers that hybridize to either the most conserved or least conserved regions of aligned nucleic acid sequences. Hence, this program is useful for identification of both
5 unique and conserved oligonucleotides and polynucleotide fragments. The oligonucleotides and polynucleotide fragments identified by any of the above selection methods are useful in hybridization technologies, for example, as PCR or sequencing primers, microarray elements, or specific probes to identify fully or partially complementary polynucleotides in a sample of nucleic acids. Methods of oligonucleotide selection are not limited to those described above.

10 A "recombinant nucleic acid" is a sequence that is not naturally occurring or has a sequence that is made by an artificial combination of two or more otherwise separated segments of sequence. This artificial combination is often accomplished by chemical synthesis or, more commonly, by the artificial manipulation of isolated segments of nucleic acids, e.g., by genetic engineering techniques such as those described in Sambrook, supra. The term recombinant includes nucleic acids that have
15 been altered solely by addition, substitution, or deletion of a portion of the nucleic acid. Frequently, a recombinant nucleic acid may include a nucleic acid sequence operably linked to a promoter sequence. Such a recombinant nucleic acid may be part of a vector that is used, for example, to transform a cell.

Alternatively, such recombinant nucleic acids may be part of a viral vector, e.g., based on a
20 vaccinia virus, that could be used to vaccinate a mammal wherein the recombinant nucleic acid is expressed, inducing a protective immunological response in the mammal.

A "regulatory element" refers to a nucleic acid sequence usually derived from untranslated regions of a gene and includes enhancers, promoters, introns, and 5' and 3' untranslated regions (UTRs). Regulatory elements interact with host or viral proteins which control transcription,
25 translation, or RNA stability.

"Reporter molecules" are chemical or biochemical moieties used for labeling a nucleic acid, amino acid, or antibody. Reporter molecules include radionuclides; enzymes; fluorescent, chemiluminescent, or chromogenic agents; substrates; cofactors; inhibitors; magnetic particles; and other moieties known in the art.

30 An "RNA equivalent," in reference to a DNA sequence, is composed of the same linear sequence of nucleotides as the reference DNA sequence with the exception that all occurrences of the nitrogenous base thymine are replaced with uracil, and the sugar backbone is composed of ribose instead of deoxyribose.

The term "sample" is used in its broadest sense. A sample suspected of containing nucleic
35 acids encoding MEMAP, or fragments thereof, or MEMAP itself, may comprise a bodily fluid; an

extract from a cell, chromosome, organelle, or membrane isolated from a cell; a cell; genomic DNA, RNA, or cDNA, in solution or bound to a substrate; a tissue; a tissue print; etc.

The terms "specific binding" and "specifically binding" refer to that interaction between a protein or peptide and an agonist, an antibody, an antagonist, a small molecule, or any natural or synthetic binding composition. The interaction is dependent upon the presence of a particular structure of the protein, e.g., the antigenic determinant or epitope, recognized by the binding molecule. For example, if an antibody is specific for epitope "A," the presence of a polypeptide comprising the epitope A, or the presence of free unlabeled A, in a reaction containing free labeled A and the antibody will reduce the amount of labeled A that binds to the antibody.

The term "substantially purified" refers to nucleic acid or amino acid sequences that are removed from their natural environment and are isolated or separated, and are at least 60% free, preferably at least 75% free, and most preferably at least 90% free from other components with which they are naturally associated.

A "substitution" refers to the replacement of one or more amino acid residues or nucleotides by different amino acid residues or nucleotides, respectively.

"Substrate" refers to any suitable rigid or semi-rigid support including membranes, filters, chips, slides, wafers, fibers, magnetic or nonmagnetic beads, gels, tubing, plates, polymers, microparticles and capillaries. The substrate can have a variety of surface forms, such as wells, trenches, pins, channels and pores, to which polynucleotides or polypeptides are bound.

A "transcript image" refers to the collective pattern of gene expression by a particular cell type or tissue under given conditions at a given time.

"Transformation" describes a process by which exogenous DNA is introduced into a recipient cell. Transformation may occur under natural or artificial conditions according to various methods well known in the art, and may rely on any known method for the insertion of foreign nucleic acid sequences into a prokaryotic or eukaryotic host cell. The method for transformation is selected based on the type of host cell being transformed and may include, but is not limited to, bacteriophage or viral infection, electroporation, heat shock, lipofection, and particle bombardment. The term "transformed" cells includes stably transformed cells in which the inserted DNA is capable of replication either as an autonomously replicating plasmid or as part of the host chromosome, as well as transiently transformed cells which express the inserted DNA or RNA for limited periods of time.

A "transgenic organism," as used herein, is any organism, including but not limited to animals and plants, in which one or more of the cells of the organism contains heterologous nucleic acid introduced by way of human intervention, such as by transgenic techniques well known in the art. The nucleic acid is introduced into the cell, directly or indirectly by introduction into a precursor of the cell, by way of deliberate genetic manipulation, such as by microinjection or by infection with

a recombinant virus. The term genetic manipulation does not include classical cross-breeding, or in vitro fertilization, but rather is directed to the introduction of a recombinant DNA molecule. The transgenic organisms contemplated in accordance with the present invention include bacteria, cyanobacteria, fungi, plants, and animals. The isolated DNA of the present invention can be introduced into the host by methods known in the art, for example infection, transfection, transformation or transconjugation. Techniques for transferring the DNA of the present invention into such organisms are widely known and provided in references such as Sambrook, J. et al. (1989), supra.

A "variant" of a particular nucleic acid sequence is defined as a nucleic acid sequence having at least 40% sequence identity to the particular nucleic acid sequence over a certain length of one of the nucleic acid sequences using blastn with the "BLAST 2 Sequences" tool Version 2.0.9 (May-07-1999) set at default parameters. Such a pair of nucleic acids may show, for example, at least 50%, at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 95% or at least 98% or greater sequence identity over a certain defined length. A variant may be described as, for example, an "allelic" (as defined above), "splice," "species," or "polymorphic" variant. A splice variant may have significant identity to a reference molecule, but will generally have a greater or lesser number of polynucleotides due to alternative splicing of exons during mRNA processing. The corresponding polypeptide may possess additional functional domains or lack domains that are present in the reference molecule. Species variants are polynucleotide sequences that vary from one species to another. The resulting polypeptides generally will have significant amino acid identity relative to each other. A polymorphic variant is a variation in the polynucleotide sequence of a particular gene between individuals of a given species. Polymorphic variants also may encompass "single nucleotide polymorphisms" (SNPs) in which the polynucleotide sequence varies by one nucleotide base. The presence of SNPs may be indicative of, for example, a certain population, a disease state, or a propensity for a disease state.

A "variant" of a particular polypeptide sequence is defined as a polypeptide sequence having at least 40% sequence identity to the particular polypeptide sequence over a certain length of one of the polypeptide sequences using blastp with the "BLAST 2 Sequences" tool Version 2.0.9 (May-07-1999) set at default parameters. Such a pair of polypeptides may show, for example, at least 50%, at least 60%, at least 70%, at least 80%, at least 90%, at least 95%, or at least 98% or greater sequence identity over a certain defined length of one of the polypeptides.

THE INVENTION

The invention is based on the discovery of new human membrane associated proteins (MEMAP), the polynucleotides encoding MEMAP, and the use of these compositions for the diagnosis, treatment, or prevention of cell proliferative, autoimmune/inflammatory, neurological and

gastrointestinal disorders.

Table 1 lists the Incyte clones used to assemble full length nucleotide sequences encoding MEMAP. Columns 1 and 2 show the sequence identification numbers (SEQ ID NOs) of the polypeptide and nucleotide sequences, respectively. Column 3 shows the clone IDs of the Incyte clones in which nucleic acids encoding each MEMAP were identified, and column 4 shows the cDNA libraries from which these clones were isolated. Column 5 shows Incyte clones and their corresponding cDNA libraries. Clones for which cDNA libraries are not indicated were derived from pooled cDNA libraries. In some cases, GenBank sequence identifiers are also shown in column 5. The Incyte clones and GenBank cDNA sequences, where indicated, in column 5 were used to assemble the consensus nucleotide sequence of each MEMAP and are useful as fragments in hybridization technologies.

The columns of Table 2 show various properties of each of the polypeptides of the invention: column 1 references the SEQ ID NO; column 2 shows the number of amino acid residues in each polypeptide; column 3 shows potential phosphorylation sites; column 4 shows potential glycosylation sites; column 5 shows the amino acid residues comprising signature sequences and motifs; column 6 shows homologous sequences as identified by BLAST analysis; and column 7 shows analytical methods and in some cases, searchable databases to which the analytical methods were applied. The methods of column 7 were used to characterize each polypeptide through sequence homology and protein motifs.

The columns of Table 3 show the tissue-specificity and diseases, disorders, or conditions associated with nucleotide sequences encoding MEMAP. The first column of Table 3 lists the nucleotide SEQ ID NOs. Column 2 lists fragments of the nucleotide sequences of column 1. These fragments are useful, for example, in hybridization or amplification technologies to identify SEQ ID NO:38-74 and to distinguish between SEQ ID NO:38-74 and related polynucleotide sequences. The polypeptides encoded by these fragments are useful, for example, as immunogenic peptides. Column 3 lists tissue categories which express MEMAP as a fraction of total tissues expressing MEMAP. Column 4 lists diseases, disorders, or conditions associated with those tissues expressing MEMAP as a fraction of total tissues expressing MEMAP. Column 5 lists the vectors used to subclone each cDNA library. Of particular note is the expression of SEQ ID NO:41, SEQ ID NO:48, and SEQ ID NO:56 in nervous tissues, of SEQ ID NO:52, SEQ ID NO:65, and SEQ ID NO:74 in gastrointestinal tissues, and of SEQ ID NO:55 in hematopoietic/immune tissues.

The columns of Table 4 show descriptions of the tissues used to construct the cDNA libraries from which cDNA clones encoding MEMAP were isolated. Column 1 references the nucleotide SEQ ID NOs, column 2 shows the cDNA libraries from which these clones were isolated, and column 3 shows the tissue origins and other descriptive information relevant to the cDNA libraries in column 2.

SEQ ID NO:38 maps to chromosome 4 within the interval from 77.9 to 86.0 centiMorgans, to chromosome 6 within the interval from 132.7 to 144.4 centiMorgans, and to chromosome 14 within the interval from 89.4 to 103.7 centiMorgans. The interval on chromosome 4 from 77.9 to 86.0 centiMorgans also contains a gene associated with deoxycytidine kinase deficiency. The interval on chromosome 6 from 132.7 to 144.4 centiMorgans also contains genes associated with peroxisomal disorders and leukemia. The interval on chromosome 14 from 89.4 to 103.7 centiMorgans also contains genes associated with spinocerebellar ataxia and protease inhibitor deficiencies. SEQ ID NO:39 maps to chromosome 2 within the interval from 236.2 to 269.5 centiMorgans, and to the X chromosome within the interval from 94.4 to 97.4 centiMorgans. The interval on chromosome 2 from 236.2 to 269.5 centiMorgans also contains genes associated with Crigler-Najjar syndrome, Oguchi disease, and oxalosis I. The interval on the X chromosome from 94.4 to 97.4 centiMorgans also contains genes associated with Charcot-Marie tooth disease, X-linked severe combined immunodeficiency, alpha thalassemia/mental retardation syndrome, Menkes' syndrome, and choroideremia. SEQ ID NO:42 maps to chromosome 1 within the interval from 218.2 to 232.0 centiMorgans. This interval also contains genes associated with familial hypertrophic cardiomyopathy, malignant hyperthermia, and hypokalemic periodic paralysis. SEQ ID NO:44 maps to chromosome 7 within the interval from 136.4 to 145.8 centiMorgans, to chromosome 14 within the interval from 28.0 to 32.9 centiMorgans, and to chromosome 14 within the interval from 71.5 to 73.7 centiMorgans. The interval on chromosome 7 from 136.4 to 145.8 centiMorgans also contains genes associated with diphosphoglycerate mutase deficiency. SEQ ID NO:60 maps to chromosome 7 within the interval from 167.6 to 184.0 centiMorgans, and to chromosome 14 within the interval from 50.0 to 59.0 centiMorgans. SEQ ID NO:63 maps to chromosome 8 within the interval from 101.0 to 125.8 centiMorgans, and to chromosome 8 within the interval from 132.4 to 135.1 centiMorgans. SEQ ID NO:67 maps to chromosome 4 within the interval from 145.3 to 146.4 centiMorgans.

The invention also encompasses MEMAP variants. A preferred MEMAP variant is one which has at least about 80%, or alternatively at least about 90%, or even at least about 95% amino acid sequence identity to the MEMAP amino acid sequence, and which contains at least one functional or structural characteristic of MEMAP.

The invention also encompasses polynucleotides which encode MEMAP. In a particular embodiment, the invention encompasses a polynucleotide sequence comprising a sequence selected from the group consisting of SEQ ID NO:38-74, which encodes MEMAP. The polynucleotide sequences of SEQ ID NO:38-74, as presented in the Sequence Listing, embrace the equivalent RNA sequences, wherein occurrences of the nitrogenous base thymine are replaced with uracil, and the sugar backbone is composed of ribose instead of deoxyribose.

The invention also encompasses a variant of a polynucleotide sequence encoding MEMAP.

In particular, such a variant polynucleotide sequence will have at least about 70%, or alternatively at least about 85%, or even at least about 95% polynucleotide sequence identity to the polynucleotide sequence encoding MEMAP. A particular aspect of the invention encompasses a variant of a polynucleotide sequence comprising a sequence selected from the group consisting of SEQ ID
5 NO:38-74 which has at least about 70%, or alternatively at least about 85%, or even at least about 95% polynucleotide sequence identity to a nucleic acid sequence selected from the group consisting of SEQ ID NO:38-74. Any one of the polynucleotide variants described above can encode an amino acid sequence which contains at least one functional or structural characteristic of MEMAP.

It will be appreciated by those skilled in the art that as a result of the degeneracy of the
10 genetic code, a multitude of polynucleotide sequences encoding MEMAP, some bearing minimal similarity to the polynucleotide sequences of any known and naturally occurring gene, may be produced. Thus, the invention contemplates each and every possible variation of polynucleotide sequence that could be made by selecting combinations based on possible codon choices. These combinations are made in accordance with the standard triplet genetic code as applied to the
15 polynucleotide sequence of naturally occurring MEMAP, and all such variations are to be considered as being specifically disclosed.

Although nucleotide sequences which encode MEMAP and its variants are generally capable of hybridizing to the nucleotide sequence of the naturally occurring MEMAP under appropriately selected conditions of stringency, it may be advantageous to produce nucleotide sequences encoding
20 MEMAP or its derivatives possessing a substantially different codon usage, e.g., inclusion of non-naturally occurring codons. Codons may be selected to increase the rate at which expression of the peptide occurs in a particular prokaryotic or eukaryotic host in accordance with the frequency with which particular codons are utilized by the host. Other reasons for substantially altering the nucleotide sequence encoding MEMAP and its derivatives without altering the encoded amino acid
25 sequences include the production of RNA transcripts having more desirable properties, such as a greater half-life, than transcripts produced from the naturally occurring sequence.

The invention also encompasses production of DNA sequences which encode MEMAP and MEMAP derivatives, or fragments thereof, entirely by synthetic chemistry. After production, the synthetic sequence may be inserted into any of the many available expression vectors and cell
30 systems using reagents well known in the art. Moreover, synthetic chemistry may be used to introduce mutations into a sequence encoding MEMAP or any fragment thereof.

Also encompassed by the invention are polynucleotide sequences that are capable of hybridizing to the claimed polynucleotide sequences, and, in particular, to those shown in SEQ ID NO:38-74 and fragments thereof under various conditions of stringency. (See, e.g., Wahl, G.M. and
35 S.L. Berger (1987) Methods Enzymol. 152:399-407; Kimmel, A.R. (1987) Methods Enzymol.

152:507-511.) Hybridization conditions, including annealing and wash conditions, are described in "Definitions."

Methods for DNA sequencing are well known in the art and may be used to practice any of the embodiments of the invention. The methods may employ such enzymes as the Klenow fragment of DNA polymerase I, SEQUENASE (US Biochemical, Cleveland OH), Taq polymerase (PE Biosystems, Foster City CA), thermostable T7 polymerase (Amersham Pharmacia Biotech, Piscataway NJ), or combinations of polymerases and proofreading exonucleases such as those found in the ELONGASE amplification system (Life Technologies, Gaithersburg MD). Preferably, sequence preparation is automated with machines such as the MICROLAB 2200 liquid transfer system (Hamilton, Reno NV), PTC200 thermal cycler (MJ Research, Watertown MA) and ABI CATALYST 800 thermal cycler (PE Biosystems). Sequencing is then carried out using either the ABI 373 or 377 DNA sequencing system (PE Biosystems), the MEGABACE 1000 DNA sequencing system (Molecular Dynamics, Sunnyvale CA), or other systems known in the art. The resulting sequences are analyzed using a variety of algorithms which are well known in the art. (See, e.g., Ausubel, F.M. (1997) Short Protocols in Molecular Biology, John Wiley & Sons, New York NY, unit 7.7; Meyers, R.A. (1995) Molecular Biology and Biotechnology, Wiley VCH, New York NY, pp. 856-853.)

The nucleic acid sequences encoding MEMAP may be extended utilizing a partial nucleotide sequence and employing various PCR-based methods known in the art to detect upstream sequences, such as promoters and regulatory elements. For example, one method which may be employed, restriction-site PCR, uses universal and nested primers to amplify unknown sequence from genomic DNA within a cloning vector. (See, e.g., Sarkar, G. (1993) PCR Methods Applic. 2:318-322.) Another method, inverse PCR, uses primers that extend in divergent directions to amplify unknown sequence from a circularized template. The template is derived from restriction fragments comprising a known genomic locus and surrounding sequences. (See, e.g., Triglia, T. et al. (1988) Nucleic Acids Res. 16:8186.) A third method, capture PCR, involves PCR amplification of DNA fragments adjacent to known sequences in human and yeast artificial chromosome DNA. (See, e.g., Lagerstrom, M. et al. (1991) PCR Methods Applic. 1:111-119.) In this method, multiple restriction enzyme digestions and ligations may be used to insert an engineered double-stranded sequence into a region of unknown sequence before performing PCR. Other methods which may be used to retrieve unknown sequences are known in the art. (See, e.g., Parker, J.D. et al. (1991) Nucleic Acids Res. 19:3055-3060). Additionally, one may use PCR, nested primers, and PROMOTERFINDER libraries (Clontech, Palo Alto CA) to walk genomic DNA. This procedure avoids the need to screen libraries and is useful in finding intron/exon junctions. For all PCR-based methods, primers may be designed using commercially available software, such as OLIGO 4.06 Primer Analysis software (National

Biosciences, Plymouth MN) or another appropriate program, to be about 22 to 30 nucleotides in length, to have a GC content of about 50% or more, and to anneal to the template at temperatures of about 68°C to 72°C.

When screening for full-length cDNAs, it is preferable to use libraries that have been
5 size-selected to include larger cDNAs. In addition, random-primed libraries, which often include sequences containing the 5' regions of genes, are preferable for situations in which an oligo d(T) library does not yield a full-length cDNA. Genomic libraries may be useful for extension of sequence into 5' non-transcribed regulatory regions.

Capillary electrophoresis systems which are commercially available may be used to analyze
10 the size or confirm the nucleotide sequence of sequencing or PCR products. In particular, capillary sequencing may employ flowable polymers for electrophoretic separation, four different nucleotide-specific, laser-stimulated fluorescent dyes, and a charge coupled device camera for detection of the emitted wavelengths. Output/light intensity may be converted to electrical signal using appropriate software (e.g., GENOTYPER and SEQUENCE NAVIGATOR, PE Biosystems), and the entire
15 process from loading of samples to computer analysis and electronic data display may be computer controlled. Capillary electrophoresis is especially preferable for sequencing small DNA fragments which may be present in limited amounts in a particular sample.

In another embodiment of the invention, polynucleotide sequences or fragments thereof which encode MEMAP may be cloned in recombinant DNA molecules that direct expression of
20 MEMAP, or fragments or functional equivalents thereof, in appropriate host cells. Due to the inherent degeneracy of the genetic code, other DNA sequences which encode substantially the same or a functionally equivalent amino acid sequence may be produced and used to express MEMAP.

The nucleotide sequences of the present invention can be engineered using methods generally known in the art in order to alter MEMAP-encoding sequences for a variety of purposes including,
25 but not limited to, modification of the cloning, processing, and/or expression of the gene product. DNA shuffling by random fragmentation and PCR reassembly of gene fragments and synthetic oligonucleotides may be used to engineer the nucleotide sequences. For example, oligonucleotide-mediated site-directed mutagenesis may be used to introduce mutations that create new restriction sites, alter glycosylation patterns, change codon preference, produce splice variants, and so forth.

30 The nucleotides of the present invention may be subjected to DNA shuffling techniques such as MOLECULARBREEDING (Maxygen Inc., Santa Clara CA; described in U.S. Patent Number 5,837,458; Chang, C.-C. et al. (1999) Nat. Biotechnol. 17:793-797; Christians, F.C. et al. (1999) Nat. Biotechnol. 17:259-264; and Crameri, A. et al. (1996) Nat. Biotechnol. 14:315-319) to alter or improve the biological properties of MEMAP, such as its biological or enzymatic activity or its
35 ability to bind to other molecules or compounds. DNA shuffling is a process by which a library of

gene variants is produced using PCR-mediated recombination of gene fragments. The library is then subjected to selection or screening procedures that identify those gene variants with the desired properties. These preferred variants may then be pooled and further subjected to recursive rounds of DNA shuffling and selection/screening. Thus, genetic diversity is created through "artificial" breeding and rapid molecular evolution. For example, fragments of a single gene containing random point mutations may be recombined, screened, and then reshuffled until the desired properties are optimized. Alternatively, fragments of a given gene may be recombined with fragments of homologous genes in the same gene family, either from the same or different species, thereby maximizing the genetic diversity of multiple naturally occurring genes in a directed and controllable manner.

In another embodiment, sequences encoding MEMAP may be synthesized, in whole or in part, using chemical methods well known in the art. (See, e.g., Caruthers, M.H. et al. (1980) *Nucleic Acids Symp. Ser. 7*:215-223; Horn, T. et al. (1980) *Nucleic Acids Symp. Ser. 7*:225-232.) Alternatively, MEMAP itself or a fragment thereof may be synthesized using chemical methods. For example, peptide synthesis can be performed using various solution-phase or solid-phase techniques. (See, e.g., Creighton, T. (1984) Proteins, Structures and Molecular Properties, WH Freeman, New York NY, pp. 55-60; and Roberge, J.Y. et al. (1995) *Science* 269:202-204.) Automated synthesis may be achieved using the ABI 431A peptide synthesizer (PE Biosystems). Additionally, the amino acid sequence of MEMAP, or any part thereof, may be altered during direct synthesis and/or combined with sequences from other proteins, or any part thereof, to produce a variant polypeptide or a polypeptide having a sequence of a naturally occurring polypeptide.

The peptide may be substantially purified by preparative high performance liquid chromatography. (See, e.g., Chiez, R.M. and F.Z. Regnier (1990) *Methods Enzymol.* 182:392-421.) The composition of the synthetic peptides may be confirmed by amino acid analysis or by sequencing. (See, e.g., Creighton, supra, pp. 28-53.)

In order to express a biologically active MEMAP, the nucleotide sequences encoding MEMAP or derivatives thereof may be inserted into an appropriate expression vector, i.e., a vector which contains the necessary elements for transcriptional and translational control of the inserted coding sequence in a suitable host. These elements include regulatory sequences, such as enhancers, constitutive and inducible promoters, and 5' and 3' untranslated regions in the vector and in polynucleotide sequences encoding MEMAP. Such elements may vary in their strength and specificity. Specific initiation signals may also be used to achieve more efficient translation of sequences encoding MEMAP. Such signals include the ATG initiation codon and adjacent sequences, e.g. the Kozak sequence. In cases where sequences encoding MEMAP and its initiation codon and upstream regulatory sequences are inserted into the appropriate expression vector, no

additional transcriptional or translational control signals may be needed. However, in cases where only coding sequence, or a fragment thereof, is inserted, exogenous translational control signals including an in-frame ATG initiation codon should be provided by the vector. Exogenous translational elements and initiation codons may be of various origins, both natural and synthetic.

- 5 The efficiency of expression may be enhanced by the inclusion of enhancers appropriate for the particular host cell system used. (See, e.g., Scharf, D. et al. (1994) *Results Probl. Cell Differ.* 20:125-162.)

Methods which are well known to those skilled in the art may be used to construct expression vectors containing sequences encoding MEMAP and appropriate transcriptional and translational
10 control elements. These methods include in vitro recombinant DNA techniques, synthetic techniques, and in vivo genetic recombination. (See, e.g., Sambrook, J. et al. (1989) Molecular Cloning, A Laboratory Manual, Cold Spring Harbor Press, Plainview NY, ch. 4, 8, and 16-17; Ausubel, F.M. et al. (1995) Current Protocols in Molecular Biology, John Wiley & Sons, New York NY, ch. 9, 13, and 16.)

15 A variety of expression vector/host systems may be utilized to contain and express sequences encoding MEMAP. These include, but are not limited to, microorganisms such as bacteria transformed with recombinant bacteriophage, plasmid, or cosmid DNA expression vectors; yeast transformed with yeast expression vectors; insect cell systems infected with viral expression vectors (e.g., baculovirus); plant cell systems transformed with viral expression vectors (e.g., cauliflower
20 mosaic virus, CaMV, or tobacco mosaic virus, TMV) or with bacterial expression vectors (e.g., Ti or pBR322 plasmids); or animal cell systems. (See, e.g., Sambrook, supra; Ausubel, supra; Van Heeke, G. and S.M. Schuster (1989) *J. Biol. Chem.* 264:5503-5509; Bitter, G.A. et al. (1987) *Methods Enzymol.* 153:516-544; Scorer, C.A. et al. (1994) *Bio/Technology* 12:181-184; Engelhard, E.K. et al. (1994) *Proc. Natl. Acad. Sci. USA* 91:3224-3227; Sandig, V. et al. (1996) *Hum. Gene Ther.* 7:1937-
25 1945; Takamatsu, N. (1987) *EMBO J.* 6:307-311; Coruzzi, G. et al. (1984) *EMBO J.* 3:1671-1680; Broglie, R. et al. (1984) *Science* 224:838-843; Winter, J. et al. (1991) *Results Probl. Cell Differ.* 17:85-105; The McGraw Hill Yearbook of Science and Technology (1992) McGraw Hill, New York NY, pp. 191-196; Logan, J. and T. Shenk (1984) *Proc. Natl. Acad. Sci. USA* 81:3655-3659; and Harrington, J.J. et al. (1997) *Nat. Genet.* 15:345-355.) Expression vectors derived from retroviruses,
30 adenoviruses, or herpes or vaccinia viruses, or from various bacterial plasmids, may be used for delivery of nucleotide sequences to the targeted organ, tissue, or cell population. (See, e.g., Di Nicola, M. et al. (1998) *Cancer Gen. Ther.* 5(6):350-356; Yu, M. et al. (1993) *Proc. Natl. Acad. Sci. USA* 90(13):6340-6344; Buller, R.M. et al. (1985) *Nature* 317(6040):813-815; McGregor, D.P. et al. (1994) *Mol. Immunol.* 31(3):219-226; and Verma, I.M. and N. Somia (1997) *Nature* 389:239-242.)

- 35 The invention is not limited by the host cell employed.

In bacterial systems, a number of cloning and expression vectors may be selected depending upon the use intended for polynucleotide sequences encoding MEMAP. For example, routine cloning, subcloning, and propagation of polynucleotide sequences encoding MEMAP can be achieved using a multifunctional *E. coli* vector such as PBLUESCRIPT (Stratagene, La Jolla CA) or PSPO11 plasmid (Life Technologies). Ligation of sequences encoding MEMAP into the vector's multiple cloning site disrupts the *lacZ* gene, allowing a colorimetric screening procedure for identification of transformed bacteria containing recombinant molecules. In addition, these vectors may be useful for *in vitro* transcription, dideoxy sequencing, single strand rescue with helper phage, and creation of nested deletions in the cloned sequence. (See, e.g., Van Heeke, G. and S.M. Schuster (1989) J. Biol. Chem. 264:5503-5509.) When large quantities of MEMAP are needed, e.g. for the production of antibodies, vectors which direct high level expression of MEMAP may be used. For example, vectors containing the strong, inducible T5 or T7 bacteriophage promoter may be used.

Yeast expression systems may be used for production of MEMAP. A number of vectors containing constitutive or inducible promoters, such as alpha factor, alcohol oxidase, and PGH promoters, may be used in the yeast *Saccharomyces cerevisiae* or *Pichia pastoris*. In addition, such vectors direct either the secretion or intracellular retention of expressed proteins and enable integration of foreign sequences into the host genome for stable propagation. (See, e.g., Ausubel, 1995, *supra*; Bitter, *supra*; and Scorer, *supra*.)

Plant systems may also be used for expression of MEMAP. Transcription of sequences encoding MEMAP may be driven viral promoters, e.g., the 35S and 19S promoters of CaMV used alone or in combination with the omega leader sequence from TMV (Takamatsu, N. (1987) EMBO J. 6:307-311). Alternatively, plant promoters such as the small subunit of RUBISCO or heat shock promoters may be used. (See, e.g., Coruzzi, *supra*; Broglie, *supra*; and Winter, *supra*.) These constructs can be introduced into plant cells by direct DNA transformation or pathogen-mediated transfection. (See, e.g., *The McGraw Hill Yearbook of Science and Technology* (1992) McGraw Hill, New York NY, pp. 191-196.)

In mammalian cells, a number of viral-based expression systems may be utilized. In cases where an adenovirus is used as an expression vector, sequences encoding MEMAP may be ligated into an adenovirus transcription/translation complex consisting of the late promoter and tripartite leader sequence. Insertion in a non-essential E1 or E3 region of the viral genome may be used to obtain infective virus which expresses MEMAP in host cells. (See, e.g., Logan, J. and T. Shenk (1984) Proc. Natl. Acad. Sci. USA 81:3655-3659.) In addition, transcription enhancers, such as the Rous sarcoma virus (RSV) enhancer, may be used to increase expression in mammalian host cells. SV40 or EBV-based vectors may also be used for high-level protein expression.

Human artificial chromosomes (HACs) may also be employed to deliver larger fragments of

DNA than can be contained in and expressed from a plasmid. HACs of about 6 kb to 10 Mb are constructed and delivered via conventional delivery methods (liposomes, polycationic amino polymers, or vesicles) for therapeutic purposes. (See, e.g., Harrington, J.J. et al. (1997) Nat. Genet. 15:345-355.)

5 For long term production of recombinant proteins in mammalian systems, stable expression of MEMAP in cell lines is preferred. For example, sequences encoding MEMAP can be transformed into cell lines using expression vectors which may contain viral origins of replication and/or endogenous expression elements and a selectable marker gene on the same or on a separate vector. Following the introduction of the vector, cells may be allowed to grow for about 1 to 2 days in
10 enriched media before being switched to selective media. The purpose of the selectable marker is to confer resistance to a selective agent, and its presence allows growth and recovery of cells which successfully express the introduced sequences. Resistant clones of stably transformed cells may be propagated using tissue culture techniques appropriate to the cell type.

Any number of selection systems may be used to recover transformed cell lines. These
15 include, but are not limited to, the herpes simplex virus thymidine kinase and adenine phosphoribosyltransferase genes, for use in *tk*⁻ and *apr*⁻ cells, respectively. (See, e.g., Wigler, M. et al. (1977) Cell 11:223-232; Lowy, I. et al. (1980) Cell 22:817-823.) Also, antimetabolite, antibiotic, or herbicide resistance can be used as the basis for selection. For example, *dhfr* confers resistance to methotrexate; *neo* confers resistance to the aminoglycosides neomycin and G-418; and *als* and *pat*
20 confer resistance to chlorsulfuron and phosphinotricin acetyltransferase, respectively. (See, e.g., Wigler, M. et al. (1980) Proc. Natl. Acad. Sci. USA 77:3567-3570; Colbere-Garapin, F. et al. (1981) J. Mol. Biol. 150:1-14.) Additional selectable genes have been described, e.g., *trpB* and *hisD*, which alter cellular requirements for metabolites. (See, e.g., Hartman, S.C. and R.C. Mulligan (1988) Proc. Natl. Acad. Sci. USA 85:8047-8051.) Visible markers, e.g., anthocyanins, green fluorescent proteins
25 (GFP; Clontech), β glucuronidase and its substrate β -glucuronide, or luciferase and its substrate luciferin may be used. These markers can be used not only to identify transformants, but also to quantify the amount of transient or stable protein expression attributable to a specific vector system. (See, e.g., Rhodes, C.A. (1995) Methods Mol. Biol. 55:121-131.)

Although the presence/absence of marker gene expression suggests that the gene of interest is
30 also present, the presence and expression of the gene may need to be confirmed. For example, if the sequence encoding MEMAP is inserted within a marker gene sequence, transformed cells containing sequences encoding MEMAP can be identified by the absence of marker gene function. Alternatively, a marker gene can be placed in tandem with a sequence encoding MEMAP under the control of a single promoter. Expression of the marker gene in response to induction or selection
35 usually indicates expression of the tandem gene as well.

In general, host cells that contain the nucleic acid sequence encoding MEMAP and that express MEMAP may be identified by a variety of procedures known to those of skill in the art. These procedures include, but are not limited to, DNA-DNA or DNA-RNA hybridizations, PCR amplification, and protein bioassay or immunoassay techniques which include membrane, solution, or chip based technologies for the detection and/or quantification of nucleic acid or protein sequences.

Immunological methods for detecting and measuring the expression of MEMAP using either specific polyclonal or monoclonal antibodies are known in the art. Examples of such techniques include enzyme-linked immunosorbent assays (ELISAs), radioimmunoassays (RIAs), and fluorescence activated cell sorting (FACS). A two-site, monoclonal-based immunoassay utilizing monoclonal antibodies reactive to two non-interfering epitopes on MEMAP is preferred, but a competitive binding assay may be employed. These and other assays are well known in the art. (See, e.g., Hampton, R. et al. (1990) Serological Methods, a Laboratory Manual, APS Press, St. Paul MN, Sect. IV; Coligan, J.E. et al. (1997) Current Protocols in Immunology, Greene Pub. Associates and Wiley-Interscience, New York NY; and Pound, J.D. (1998) Immunochemical Protocols, Humana Press, Totowa NJ.)

A wide variety of labels and conjugation techniques are known by those skilled in the art and may be used in various nucleic acid and amino acid assays. Means for producing labeled hybridization or PCR probes for detecting sequences related to polynucleotides encoding MEMAP include oligolabeling, nick translation, end-labeling, or PCR amplification using a labeled nucleotide. Alternatively, the sequences encoding MEMAP, or any fragments thereof, may be cloned into a vector for the production of an mRNA probe. Such vectors are known in the art, are commercially available, and may be used to synthesize RNA probes *in vitro* by addition of an appropriate RNA polymerase such as T7, T3, or SP6 and labeled nucleotides. These procedures may be conducted using a variety of commercially available kits, such as those provided by Amersham Pharmacia Biotech, Promega (Madison WI), and US Biochemical. Suitable reporter molecules or labels which may be used for ease of detection include radionuclides, enzymes, fluorescent, chemiluminescent, or chromogenic agents, as well as substrates, cofactors, inhibitors, magnetic particles, and the like.

Host cells transformed with nucleotide sequences encoding MEMAP may be cultured under conditions suitable for the expression and recovery of the protein from cell culture. The protein produced by a transformed cell may be secreted or retained intracellularly depending on the sequence and/or the vector used. As will be understood by those of skill in the art, expression vectors containing polynucleotides which encode MEMAP may be designed to contain signal sequences which direct secretion of MEMAP through a prokaryotic or eukaryotic cell membrane.

In addition, a host cell strain may be chosen for its ability to modulate expression of the inserted sequences or to process the expressed protein in the desired fashion. Such modifications of

the polypeptide include, but are not limited to, acetylation, carboxylation, glycosylation, phosphorylation, lipidation, and acylation. Post-translational processing which cleaves a "prepro" or "pro" form of the protein may also be used to specify protein targeting, folding, and/or activity.

Different host cells which have specific cellular machinery and characteristic mechanisms for post-translational activities (e.g., CHO, HeLa, MDCK, HEK293, and WI38) are available from the American Type Culture Collection (ATCC, Manassas VA) and may be chosen to ensure the correct modification and processing of the foreign protein.

In another embodiment of the invention, natural, modified, or recombinant nucleic acid sequences encoding MEMAP may be ligated to a heterologous sequence resulting in translation of a fusion protein in any of the aforementioned host systems. For example, a chimeric MEMAP protein containing a heterologous moiety that can be recognized by a commercially available antibody may facilitate the screening of peptide libraries for inhibitors of MEMAP activity. Heterologous protein and peptide moieties may also facilitate purification of fusion proteins using commercially available affinity matrices. Such moieties include, but are not limited to, glutathione S-transferase (GST), maltose binding protein (MBP), thioredoxin (Trx), calmodulin binding peptide (CBP), 6-His, FLAG, *c-myc*, and hemagglutinin (HA). GST, MBP, Trx, CBP, and 6-His enable purification of their cognate fusion proteins on immobilized glutathione, maltose, phenylarsine oxide, calmodulin, and metal-chelate resins, respectively. FLAG, *c-myc*, and hemagglutinin (HA) enable immunoaffinity purification of fusion proteins using commercially available monoclonal and polyclonal antibodies that specifically recognize these epitope tags. A fusion protein may also be engineered to contain a proteolytic cleavage site located between the MEMAP encoding sequence and the heterologous protein sequence, so that MEMAP may be cleaved away from the heterologous moiety following purification. Methods for fusion protein expression and purification are discussed in Ausubel (1995, supra, ch. 10). A variety of commercially available kits may also be used to facilitate expression and purification of fusion proteins.

In a further embodiment of the invention, synthesis of radiolabeled MEMAP may be achieved in vitro using the TNT rabbit reticulocyte lysate or wheat germ extract system (Promega). These systems couple transcription and translation of protein-coding sequences operably associated with the T7, T3, or SP6 promoters. Translation takes place in the presence of a radiolabeled amino acid precursor, for example, ³⁵S-methionine.

MEMAP of the present invention or fragments thereof may be used to screen for compounds that specifically bind to MEMAP. At least one and up to a plurality of test compounds may be screened for specific binding to MEMAP. Examples of test compounds include antibodies, oligonucleotides, proteins (e.g., receptors), or small molecules.

In one embodiment, the compound thus identified is closely related to the natural ligand of

MEMAP, e.g., a ligand or fragment thereof, a natural substrate, a structural or functional mimetic, or a natural binding partner. (See, Coligan, J.E. et al. (1991) Current Protocols in Immunology 1(2): Chapter 5.) Similarly, the compound can be closely related to the natural receptor to which MEMAP binds, or to at least a fragment of the receptor, e.g., the ligand binding site. In either case, the compound can be rationally designed using known techniques. In one embodiment, screening for these compounds involves producing appropriate cells which express MEMAP, either as a secreted protein or on the cell membrane. Preferred cells include cells from mammals, yeast, Drosophila, or E. coli. Cells expressing MEMAP or cell membrane fractions which contain MEMAP are then contacted with a test compound and binding, stimulation, or inhibition of activity of either MEMAP or the compound is analyzed.

An assay may simply test binding of a test compound to the polypeptide, wherein binding is detected by a fluorophore, radioisotope, enzyme conjugate, or other detectable label. For example, the assay may comprise the steps of combining at least one test compound with MEMAP, either in solution or affixed to a solid support, and detecting the binding of MEMAP to the compound. Alternatively, the assay may detect or measure binding of a test compound in the presence of a labeled competitor. Additionally, the assay may be carried out using cell-free preparations, chemical libraries, or natural product mixtures, and the test compound(s) may be free in solution or affixed to a solid support.

MEMAP of the present invention or fragments thereof may be used to screen for compounds that modulate the activity of MEMAP. Such compounds may include agonists, antagonists, or partial or inverse agonists. In one embodiment, an assay is performed under conditions permissive for MEMAP activity, wherein MEMAP is combined with at least one test compound, and the activity of MEMAP in the presence of a test compound is compared with the activity of MEMAP in the absence of the test compound. A change in the activity of MEMAP in the presence of the test compound is indicative of a compound that modulates the activity of MEMAP. Alternatively, a test compound is combined with an in vitro or cell-free system comprising MEMAP under conditions suitable for MEMAP activity, and the assay is performed. In either of these assays, a test compound which modulates the activity of MEMAP may do so indirectly and need not come in direct contact with the test compound. At least one and up to a plurality of test compounds may be screened.

In another embodiment, polynucleotides encoding MEMAP or their mammalian homologs may be "knocked out" in an animal model system using homologous recombination in embryonic stem (ES) cells. Such techniques are well known in the art and are useful for the generation of animal models of human disease. (See, e.g., U.S. Patent No. 5,175,383 and U.S. Patent No. 5,767,337.) For example, mouse ES cells, such as the mouse 129/SvJ cell line, are derived from the early mouse embryo and grown in culture. The ES cells are transformed with a vector containing the gene of

interest disrupted by a marker gene, e.g., the neomycin phosphotransferase gene (neo; Capecchi, M.R. (1989) Science 244:1288-1292). The vector integrates into the corresponding region of the host genome by homologous recombination. Alternatively, homologous recombination takes place using the Cre-loxP system to knockout a gene of interest in a tissue- or developmental stage-specific manner (Marth, J.D. (1996) Clin. Invest. 97:1999-2002; Wagner, K.U. et al. (1997) Nucleic Acids Res. 25:4323-4330). Transformed ES cells are identified and microinjected into mouse cell blastocysts such as those from the C57BL/6 mouse strain. The blastocysts are surgically transferred to pseudopregnant dams, and the resulting chimeric progeny are genotyped and bred to produce heterozygous or homozygous strains. Transgenic animals thus generated may be tested with potential therapeutic or toxic agents.

Polynucleotides encoding MEMAP may also be manipulated in vitro in ES cells derived from human blastocysts. Human ES cells have the potential to differentiate into at least eight separate cell lineages including endoderm, mesoderm, and ectodermal cell types. These cell lineages differentiate into, for example, neural cells, hematopoietic lineages, and cardiomyocytes (Thomson, J.A. et al. (1998) Science 282:1145-1147).

Polynucleotides encoding MEMAP can also be used to create "knockin" humanized animals (pigs) or transgenic animals (mice or rats) to model human disease. With knockin technology, a region of a polynucleotide encoding MEMAP is injected into animal ES cells, and the injected sequence integrates into the animal cell genome. Transformed cells are injected into blastulae, and the blastulae are implanted as described above. Transgenic progeny or inbred lines are studied and treated with potential pharmaceutical agents to obtain information on treatment of a human disease. Alternatively, a mammal inbred to overexpress MEMAP, e.g., by secreting MEMAP in its milk, may also serve as a convenient source of that protein (Janne, J. et al. (1998) Biotechnol. Annu. Rev. 4:55-74).

25 THERAPEUTICS

Chemical and structural similarity, e.g., in the context of sequences and motifs, exists between regions of MEMAP and membrane associated proteins. In addition, the expression of MEMAP is closely associated with neurological and gastrointestinal tissues, cancer, cell proliferation, and inflammation/trauma. Therefore, MEMAP appears to play a role in cell proliferative, autoimmune/inflammatory, neurological and gastrointestinal disorders. In the treatment of disorders associated with increased MEMAP expression or activity, it is desirable to decrease the expression or activity of MEMAP. In the treatment of disorders associated with decreased MEMAP expression or activity, it is desirable to increase the expression or activity of MEMAP.

Therefore, in one embodiment, MEMAP or a fragment or derivative thereof may be administered to a subject to treat or prevent a disorder associated with decreased expression or

activity of MEMAP. Examples of such disorders include, but are not limited to, a cell proliferative disorder such as actinic keratosis, arteriosclerosis, atherosclerosis, bursitis, cirrhosis, hepatitis, mixed connective tissue disease (MCTD), myelofibrosis, paroxysmal nocturnal hemoglobinuria, polycythemia vera, psoriasis, primary thrombocythemia, and cancers including adenocarcinoma, leukemia, lymphoma, melanoma, myeloma, sarcoma, teratocarcinoma, and, in particular, cancers of the adrenal gland, bladder, bone, bone marrow, brain, breast, cervix, gall bladder, ganglia, gastrointestinal tract, heart, kidney, liver, lung, muscle, ovary, pancreas, parathyroid, penis, prostate, salivary glands, skin, spleen, testis, thymus, thyroid, and uterus; an autoimmune/inflammatory disorder such as acquired immunodeficiency syndrome (AIDS), Addison's disease, adult respiratory distress syndrome, allergies, ankylosing spondylitis, amyloidosis, anemia, asthma, atherosclerosis, autoimmune hemolytic anemia, autoimmune thyroiditis, autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED), bronchitis, cholecystitis, contact dermatitis, Crohn's disease, atopic dermatitis, dermatomyositis, diabetes mellitus, emphysema, episodic lymphopenia with lymphocytotoxins, erythroblastosis fetalis, erythema nodosum, atrophic gastritis, glomerulonephritis, Goodpasture's syndrome, gout, Graves' disease, Hashimoto's thyroiditis, hypereosinophilia, irritable bowel syndrome, multiple sclerosis, myasthenia gravis, myocardial or pericardial inflammation, osteoarthritis, osteoporosis, pancreatitis, polymyositis, psoriasis, Reiter's syndrome, rheumatoid arthritis, scleroderma, Sjögren's syndrome, systemic anaphylaxis, systemic lupus erythematosus, systemic sclerosis, thrombocytopenic purpura, ulcerative colitis, uveitis, Werner syndrome, complications of cancer, hemodialysis, and extracorporeal circulation, viral, bacterial, fungal, parasitic, protozoal, and helminthic infections, and trauma; a neurological disorder such as epilepsy, ischemic cerebrovascular disease, stroke, cerebral neoplasms, Alzheimer's disease, Pick's disease, Huntington's disease, dementia, Parkinson's disease and other extrapyramidal disorders, amyotrophic lateral sclerosis and other motor neuron disorders, progressive neural muscular atrophy, retinitis pigmentosa, hereditary ataxias, multiple sclerosis and other demyelinating diseases, bacterial and viral meningitis, brain abscess, subdural empyema, epidural abscess, suppurative intracranial thrombophlebitis, myelitis and radiculitis, viral central nervous system disease, prion diseases including kuru, Creutzfeldt-Jakob disease, and Gerstmann-Straussler-Scheinker syndrome, fatal familial insomnia, nutritional and metabolic diseases of the nervous system, neurofibromatosis, tuberous sclerosis, cerebelloretinal hemangioblastomatosis, encephalotrigeminal syndrome, mental retardation and other developmental disorders of the central nervous system, cerebral palsy, neuroskeletal disorders, autonomic nervous system disorders, cranial nerve disorders, spinal cord diseases, muscular dystrophy and other neuromuscular disorders, peripheral nervous system disorders, dermatomyositis and polymyositis, inherited, metabolic, endocrine, and toxic myopathies, myasthenia gravis, periodic paralysis, mental disorders including

mood, anxiety, and schizophrenic disorders, seasonal affective disorder (SAD), akathisia, amnesia, catatonia, diabetic neuropathy, tardive dyskinesia, dystonias, paranoid psychoses, postherpetic neuralgia, Tourette's disorder, progressive supranuclear palsy, corticobasal degeneration, and familial frontotemporal dementia; and a gastrointestinal disorder such as dysphagia, peptic esophagitis, esophageal spasm, esophageal stricture, esophageal carcinoma, dyspepsia, indigestion, gastritis, gastric carcinoma, anorexia, nausea, emesis, gastroparesis, antral or pyloric edema, abdominal angina, pyrosis, gastroenteritis, intestinal obstruction, infections of the intestinal tract, peptic ulcer, cholelithiasis, cholecystitis, cholestasis, pancreatitis, pancreatic carcinoma, biliary tract disease, hepatitis, hyperbilirubinemia, cirrhosis, passive congestion of the liver, hepatoma, infectious colitis, ulcerative colitis, ulcerative proctitis, Crohn's disease, Whipple's disease, Mallory-Weiss syndrome, colonic carcinoma, colonic obstruction, irritable bowel syndrome, short bowel syndrome, diarrhea, constipation, gastrointestinal hemorrhage, acquired immunodeficiency syndrome (AIDS) enteropathy, jaundice, hepatic encephalopathy, hepatorenal syndrome, hepatic steatosis, hemochromatosis, Wilson's disease, alpha₁-antitrypsin deficiency, Reye's syndrome, primary sclerosing cholangitis, liver infarction, portal vein obstruction and thrombosis, centrilobular necrosis, peliosis hepatis, hepatic vein thrombosis, veno-occlusive disease, preeclampsia, eclampsia, acute fatty liver of pregnancy, intrahepatic cholestasis of pregnancy, and hepatic tumors including nodular hyperplasias, adenomas, and carcinomas.

In another embodiment, a vector capable of expressing MEMAP or a fragment or derivative thereof may be administered to a subject to treat or prevent a disorder associated with decreased expression or activity of MEMAP including, but not limited to, those described above.

In a further embodiment, a composition comprising a substantially purified MEMAP in conjunction with a suitable pharmaceutical carrier may be administered to a subject to treat or prevent a disorder associated with decreased expression or activity of MEMAP including, but not limited to, those provided above.

In still another embodiment, an agonist which modulates the activity of MEMAP may be administered to a subject to treat or prevent a disorder associated with decreased expression or activity of MEMAP including, but not limited to, those listed above.

In a further embodiment, an antagonist of MEMAP may be administered to a subject to treat or prevent a disorder associated with increased expression or activity of MEMAP. Examples of such disorders include, but are not limited to, those cell proliferative, autoimmune/inflammatory, neurological and gastrointestinal disorders described above. In one aspect, an antibody which specifically binds MEMAP may be used directly as an antagonist or indirectly as a targeting or delivery mechanism for bringing a pharmaceutical agent to cells or tissues which express MEMAP.

In an additional embodiment, a vector expressing the complement of the polynucleotide

encoding MEMAP may be administered to a subject to treat or prevent a disorder associated with increased expression or activity of MEMAP including, but not limited to, those described above.

In other embodiments, any of the proteins, antagonists, antibodies, agonists, complementary sequences, or vectors of the invention may be administered in combination with other appropriate therapeutic agents. Selection of the appropriate agents for use in combination therapy may be made by one of ordinary skill in the art, according to conventional pharmaceutical principles. The combination of therapeutic agents may act synergistically to effect the treatment or prevention of the various disorders described above. Using this approach, one may be able to achieve therapeutic efficacy with lower dosages of each agent, thus reducing the potential for adverse side effects.

An antagonist of MEMAP may be produced using methods which are generally known in the art. In particular, purified MEMAP may be used to produce antibodies or to screen libraries of pharmaceutical agents to identify those which specifically bind MEMAP. Antibodies to MEMAP may also be generated using methods that are well known in the art. Such antibodies may include, but are not limited to, polyclonal, monoclonal, chimeric, and single chain antibodies, Fab fragments, and fragments produced by a Fab expression library. Neutralizing antibodies (i.e., those which inhibit dimer formation) are generally preferred for therapeutic use.

For the production of antibodies, various hosts including goats, rabbits, rats, mice, humans, and others may be immunized by injection with MEMAP or with any fragment or oligopeptide thereof which has immunogenic properties. Depending on the host species, various adjuvants may be used to increase immunological response. Such adjuvants include, but are not limited to, Freund's, mineral gels such as aluminum hydroxide, and surface active substances such as lysolecithin, pluronic polyols, polyanions, peptides, oil emulsions, KLH, and dinitrophenol. Among adjuvants used in humans, BCG (bacilli Calmette-Guerin) and Corynebacterium parvum are especially preferable.

It is preferred that the oligopeptides, peptides, or fragments used to induce antibodies to MEMAP have an amino acid sequence consisting of at least about 5 amino acids, and generally will consist of at least about 10 amino acids. It is also preferable that these oligopeptides, peptides, or fragments are identical to a portion of the amino acid sequence of the natural protein. Short stretches of MEMAP amino acids may be fused with those of another protein, such as KLH, and antibodies to the chimeric molecule may be produced.

Monoclonal antibodies to MEMAP may be prepared using any technique which provides for the production of antibody molecules by continuous cell lines in culture. These include, but are not limited to, the hybridoma technique, the human B-cell hybridoma technique, and the EBV-hybridoma technique. (See, e.g., Kohler, G. et al. (1975) Nature 256:495-497; Kozbor, D. et al. (1985) J. Immunol. Methods 81:31-42; Cote, R.J. et al. (1983) Proc. Natl. Acad. Sci. USA 80:2026-2030; and Cole, S.P. et al. (1984) Mol. Cell Biol. 62:109-120.)

In addition, techniques developed for the production of "chimeric antibodies," such as the splicing of mouse antibody genes to human antibody genes to obtain a molecule with appropriate antigen specificity and biological activity, can be used. (See, e.g., Morrison, S.L. et al. (1984) Proc. Natl. Acad. Sci. USA 81:6851-6855; Neuberger, M.S. et al. (1984) Nature 312:604-608; and Takeda, S. et al. (1985) Nature 314:452-454.) Alternatively, techniques described for the production of single chain antibodies may be adapted, using methods known in the art, to produce MEMAP-specific single chain antibodies. Antibodies with related specificity, but of distinct idiotypic composition, may be generated by chain shuffling from random combinatorial immunoglobulin libraries. (See, e.g., Burton, D.R. (1991) Proc. Natl. Acad. Sci. USA 88:10134-10137.)

Antibodies may also be produced by inducing in vivo production in the lymphocyte population or by screening immunoglobulin libraries or panels of highly specific binding reagents as disclosed in the literature. (See, e.g., Orlandi, R. et al. (1989) Proc. Natl. Acad. Sci. USA 86:3833-3837; Winter, G. et al. (1991) Nature 349:293-299.)

Antibody fragments which contain specific binding sites for MEMAP may also be generated. For example, such fragments include, but are not limited to, F(ab')₂ fragments produced by pepsin digestion of the antibody molecule and Fab fragments generated by reducing the disulfide bridges of the F(ab')₂ fragments. Alternatively, Fab expression libraries may be constructed to allow rapid and easy identification of monoclonal Fab fragments with the desired specificity. (See, e.g., Huse, W.D. et al. (1989) Science 246:1275-1281.)

Various immunoassays may be used for screening to identify antibodies having the desired specificity. Numerous protocols for competitive binding or immunoradiometric assays using either polyclonal or monoclonal antibodies with established specificities are well known in the art. Such immunoassays typically involve the measurement of complex formation between MEMAP and its specific antibody. A two-site, monoclonal-based immunoassay utilizing monoclonal antibodies reactive to two non-interfering MEMAP epitopes is generally used, but a competitive binding assay may also be employed (Pound, supra).

Various methods such as Scatchard analysis in conjunction with radioimmunoassay techniques may be used to assess the affinity of antibodies for MEMAP. Affinity is expressed as an association constant, K_a , which is defined as the molar concentration of MEMAP-antibody complex divided by the molar concentrations of free antigen and free antibody under equilibrium conditions. The K_a determined for a preparation of polyclonal antibodies, which are heterogeneous in their affinities for multiple MEMAP epitopes, represents the average affinity, or avidity, of the antibodies for MEMAP. The K_a determined for a preparation of monoclonal antibodies, which are monospecific for a particular MEMAP epitope, represents a true measure of affinity. High-affinity antibody preparations with K_a ranging from about 10^9 to 10^{12} L/mole are preferred for use in immunoassays in

which the MEMAP-antibody complex must withstand rigorous manipulations. Low-affinity antibody preparations with K_a ranging from about 10^6 to 10^7 L/mole are preferred for use in immunopurification and similar procedures which ultimately require dissociation of MEMAP, preferably in active form, from the antibody (Catty, D. (1988) Antibodies, Volume I: A Practical Approach, IRL Press, Washington DC; Liddell, J.E. and A. Cryer (1991) A Practical Guide to Monoclonal Antibodies, John Wiley & Sons, New York NY).

The titer and avidity of polyclonal antibody preparations may be further evaluated to determine the quality and suitability of such preparations for certain downstream applications. For example, a polyclonal antibody preparation containing at least 1-2 mg specific antibody/ml, preferably 5-10 mg specific antibody/ml, is generally employed in procedures requiring precipitation of MEMAP-antibody complexes. Procedures for evaluating antibody specificity, titer, and avidity, and guidelines for antibody quality and usage in various applications, are generally available. (See, e.g., Catty, supra, and Coligan et al., supra.)

In another embodiment of the invention, the polynucleotides encoding MEMAP, or any fragment or complement thereof, may be used for therapeutic purposes. In one aspect, modifications of gene expression can be achieved by designing complementary sequences or antisense molecules (DNA, RNA, PNA, or modified oligonucleotides) to the coding or regulatory regions of the gene encoding MEMAP. Such technology is well known in the art, and antisense oligonucleotides or larger fragments can be designed from various locations along the coding or control regions of sequences encoding MEMAP. (See, e.g., Agrawal, S., ed. (1996) Antisense Therapeutics, Humana Press Inc., Totawa NJ.)

In therapeutic use, any gene delivery system suitable for introduction of the antisense sequences into appropriate target cells can be used. Antisense sequences can be delivered intracellularly in the form of an expression plasmid which, upon transcription, produces a sequence complementary to at least a portion of the cellular sequence encoding the target protein. (See, e.g., Slater, J.E. et al. (1998) *J. Allergy Clin. Immunol.* 102(3):469-475; and Scanlon, K.J. et al. (1995) 9(13):1288-1296.) Antisense sequences can also be introduced intracellularly through the use of viral vectors, such as retrovirus and adeno-associated virus vectors. (See, e.g., Miller, A.D. (1990) *Blood* 76:271; Ausubel, supra; Uckert, W. and W. Walther (1994) *Pharmacol. Ther.* 63(3):323-347.) Other gene delivery mechanisms include liposome-derived systems, artificial viral envelopes, and other systems known in the art. (See, e.g., Rossi, J.J. (1995) *Br. Med. Bull.* 51(1):217-225; Boado, R.J. et al. (1998) *J. Pharm. Sci.* 87(11):1308-1315; and Morris, M.C. et al. (1997) *Nucleic Acids Res.* 25(14):2730-2736.)

In another embodiment of the invention, polynucleotides encoding MEMAP may be used for somatic or germline gene therapy. Gene therapy may be performed to (i) correct a genetic deficiency

(e.g., in the cases of severe combined immunodeficiency (SCID)-X1 disease characterized by X-linked inheritance (Cavazzana-Calvo, M. et al. (2000) *Science* 288:669-672), severe combined immunodeficiency syndrome associated with an inherited adenosine deaminase (ADA) deficiency (Blaese, R.M. et al. (1995) *Science* 270:475-480; Bordignon, C. et al. (1995) *Science* 270:470-475), cystic fibrosis (Zabner, J. et al. (1993) *Cell* 75:207-216; Crystal, R.G. et al. (1995) *Hum. Gene Therapy* 6:643-666; Crystal, R.G. et al. (1995) *Hum. Gene Therapy* 6:667-703), thalassemias, familial hypercholesterolemia, and hemophilia resulting from Factor VIII or Factor IX deficiencies (Crystal, R.G. (1995) *Science* 270:404-410; Verma, I.M. and N. Somia (1997) *Nature* 389:239-242)), (ii) express a conditionally lethal gene product (e.g., in the case of cancers which result from unregulated cell proliferation), or (iii) express a protein which affords protection against intracellular parasites (e.g., against human retroviruses, such as human immunodeficiency virus (HIV) (Baltimore, D. (1988) *Nature* 335:395-396; Poeschla, E. et al. (1996) *Proc. Natl. Acad. Sci. USA* 93:11395-11399), hepatitis B or C virus (HBV, HCV); fungal parasites, such as Candida albicans and Paracoccidioides brasiliensis; and protozoan parasites such as Plasmodium falciparum and Trypanosoma cruzi). In the case where a genetic deficiency in MEMAP expression or regulation causes disease, the expression of MEMAP from an appropriate population of transduced cells may alleviate the clinical manifestations caused by the genetic deficiency.

In a further embodiment of the invention, diseases or disorders caused by deficiencies in MEMAP are treated by constructing mammalian expression vectors encoding MEMAP and introducing these vectors by mechanical means into MEMAP-deficient cells. Mechanical transfer technologies for use with cells in vivo or ex vitro include (i) direct DNA microinjection into individual cells, (ii) ballistic gold particle delivery, (iii) liposome-mediated transfection, (iv) receptor-mediated gene transfer, and (v) the use of DNA transposons (Morgan, R.A. and W.F. Anderson (1993) *Annu. Rev. Biochem.* 62:191-217; Ivics, Z. (1997) *Cell* 91:501-510; Boulay, J-L. and H. Récipon (1998) *Curr. Opin. Biotechnol.* 9:445-450).

Expression vectors that may be effective for the expression of MEMAP include, but are not limited to, the PCDNA 3.1, EPITAG, PRCCMV2, PREP, PVAX vectors (Invitrogen, Carlsbad CA), PCMV-SCRIPT, PCMV-TAG, PEGSH/PERV (Stratagene, La Jolla CA), and PTET-OFF, PTET-ON, PTRE2, PTRE2-LUC, PTK-HYG (Clontech, Palo Alto CA). MEMAP may be expressed using (i) a constitutively active promoter, (e.g., from cytomegalovirus (CMV), Rous sarcoma virus (RSV), SV40 virus, thymidine kinase (TK), or β -actin genes), (ii) an inducible promoter (e.g., the tetracycline-regulated promoter (Gossen, M. and H. Bujard (1992) *Proc. Natl. Acad. Sci. USA* 89:5547-5551; Gossen, M. et al. (1995) *Science* 268:1766-1769; Rossi, F.M.V. and H.M. Blau (1998) *Curr. Opin. Biotechnol.* 9:451-456), commercially available in the T-REX plasmid (Invitrogen)); the ecdysone-inducible promoter (available in the plasmids PVGRXR and PIND; Invitrogen); the

FK506/rapamycin inducible promoter; or the RU486/mifepristone inducible promoter (Rossi, F.M.V. and H.M. Blau, supra), or (iii) a tissue-specific promoter or the native promoter of the endogenous gene encoding MEMAP from a normal individual.

Commercially available liposome transformation kits (e.g., the PERFECT LIPID TRANSFECTION KIT, available from Invitrogen) allow one with ordinary skill in the art to deliver polynucleotides to target cells in culture and require minimal effort to optimize experimental parameters. In the alternative, transformation is performed using the calcium phosphate method (Graham, F.L. and A.J. Eb (1973) *Virology* 52:456-467), or by electroporation (Neumann, E. et al. (1982) *EMBO J.* 1:841-845). The introduction of DNA to primary cells requires modification of these standardized mammalian transfection protocols.

In another embodiment of the invention, diseases or disorders caused by genetic defects with respect to MEMAP expression are treated by constructing a retrovirus vector consisting of (i) the polynucleotide encoding MEMAP under the control of an independent promoter or the retrovirus long terminal repeat (LTR) promoter, (ii) appropriate RNA packaging signals, and (iii) a Rev-responsive element (RRE) along with additional retrovirus *cis*-acting RNA sequences and coding sequences required for efficient vector propagation. Retrovirus vectors (e.g., PFB and PFBNEO) are commercially available (Stratagene) and are based on published data (Riviere, I. et al. (1995) *Proc. Natl. Acad. Sci. USA* 92:6733-6737), incorporated by reference herein. The vector is propagated in an appropriate vector producing cell line (VPCL) that expresses an envelope gene with a tropism for receptors on the target cells or a promiscuous envelope protein such as VSVg (Armentano, D. et al. (1987) *J. Virol.* 61:1647-1650; Bender, M.A. et al. (1987) *J. Virol.* 61:1639-1646; Adam, M.A. and A.D. Miller (1988) *J. Virol.* 62:3802-3806; Dull, T. et al. (1998) *J. Virol.* 72:8463-8471; Zufferey, R. et al. (1998) *J. Virol.* 72:9873-9880). U.S. Patent Number 5,910,434 to Rigg ("Method for obtaining retrovirus packaging cell lines producing high transducing efficiency retroviral supernatant") discloses a method for obtaining retrovirus packaging cell lines and is hereby incorporated by reference. Propagation of retrovirus vectors, transduction of a population of cells (e.g., CD4⁺ T-cells), and the return of transduced cells to a patient are procedures well known to persons skilled in the art of gene therapy and have been well documented (Ranga, U. et al. (1997) *J. Virol.* 71:7020-7029; Bauer, G. et al. (1997) *Blood* 89:2259-2267; Bonyhadi, M.L. (1997) *J. Virol.* 71:4707-4716; Ranga, U. et al. (1998) *Proc. Natl. Acad. Sci. USA* 95:1201-1206; Su, L. (1997) *Blood* 89:2283-2290).

In the alternative, an adenovirus-based gene therapy delivery system is used to deliver polynucleotides encoding MEMAP to cells which have one or more genetic abnormalities with respect to the expression of MEMAP. The construction and packaging of adenovirus-based vectors are well known to those with ordinary skill in the art. Replication defective adenovirus vectors have

proven to be versatile for importing genes encoding immunoregulatory proteins into intact islets in the pancreas (Csete, M.E. et al. (1995) Transplantation 27:263-268). Potentially useful adenoviral vectors are described in U.S. Patent Number 5,707,618 to Armentano ("Adenovirus vectors for gene therapy"), hereby incorporated by reference. For adenoviral vectors, see also Antinozzi, P.A. et al. (1999) Annu. Rev. Nutr. 19:511-544; and Verma, I.M. and N. Somia (1997) Nature 389:239-242, both incorporated by reference herein.

In another alternative, a herpes-based, gene therapy delivery system is used to deliver polynucleotides encoding MEMAP to target cells which have one or more genetic abnormalities with respect to the expression of MEMAP. The use of herpes simplex virus (HSV)-based vectors may be especially valuable for introducing MEMAP to cells of the central nervous system, for which HSV has a tropism. The construction and packaging of herpes-based vectors are well known to those with ordinary skill in the art. A replication-competent herpes simplex virus (HSV) type 1-based vector has been used to deliver a reporter gene to the eyes of primates (Liu, X. et al. (1999) Exp. Eye Res. 69:385-395). The construction of a HSV-1 virus vector has also been disclosed in detail in U.S. Patent Number 5,804,413 to DeLuca ("Herpes simplex virus strains for gene transfer"), which is hereby incorporated by reference. U.S. Patent Number 5,804,413 teaches the use of recombinant HSV d92 which consists of a genome containing at least one exogenous gene to be transferred to a cell under the control of the appropriate promoter for purposes including human gene therapy. Also taught by this patent are the construction and use of recombinant HSV strains deleted for ICP4, ICP27 and ICP22. For HSV vectors, see also Goins, W.F. et al. (1999) J. Virol. 73:519-532 and Xu, H. et al. (1994) Dev. Biol. 163:152-161, hereby incorporated by reference. The manipulation of cloned herpesvirus sequences, the generation of recombinant virus following the transfection of multiple plasmids containing different segments of the large herpesvirus genomes, the growth and propagation of herpesvirus, and the infection of cells with herpesvirus are techniques well known to those of ordinary skill in the art.

In another alternative, an alphavirus (positive, single-stranded RNA virus) vector is used to deliver polynucleotides encoding MEMAP to target cells. The biology of the prototypic alphavirus, Semliki Forest Virus (SFV), has been studied extensively and gene transfer vectors have been based on the SFV genome (Garoff, H. and K.-J. Li (1998) Curr. Opin. Biotechnol. 9:464-469). During alphavirus RNA replication, a subgenomic RNA is generated that normally encodes the viral capsid proteins. This subgenomic RNA replicates to higher levels than the full-length genomic RNA, resulting in the overproduction of capsid proteins relative to the viral proteins with enzymatic activity (e.g., protease and polymerase). Similarly, inserting the coding sequence for MEMAP into the alphavirus genome in place of the capsid-coding region results in the production of a large number of MEMAP-coding RNAs and the synthesis of high levels of MEMAP in vector transduced cells. While

alphavirus infection is typically associated with cell lysis within a few days, the ability to establish a persistent infection in hamster normal kidney cells (BHK-21) with a variant of Sindbis virus (SIN) indicates that the lytic replication of alphaviruses can be altered to suit the needs of the gene therapy application (Dryga, S.A. et al. (1997) Virology 228:74-83). The wide host range of alphaviruses will allow the introduction of MEMAP into a variety of cell types. The specific transduction of a subset of cells in a population may require the sorting of cells prior to transduction. The methods of manipulating infectious cDNA clones of alphaviruses, performing alphavirus cDNA and RNA transfections, and performing alphavirus infections, are well known to those with ordinary skill in the art.

Oligonucleotides derived from the transcription initiation site, e.g., between about positions -10 and +10 from the start site, may also be employed to inhibit gene expression. Similarly, inhibition can be achieved using triple helix base-pairing methodology. Triple helix pairing is useful because it causes inhibition of the ability of the double helix to open sufficiently for the binding of polymerases, transcription factors, or regulatory molecules. Recent therapeutic advances using triplex DNA have been described in the literature. (See, e.g., Gee, J.E. et al. (1994) in Huber, B.E. and B.I. Carr, Molecular and Immunologic Approaches, Futura Publishing, Mt. Kisco NY, pp. 163-177.) A complementary sequence or antisense molecule may also be designed to block translation of mRNA by preventing the transcript from binding to ribosomes.

Ribozymes, enzymatic RNA molecules, may also be used to catalyze the specific cleavage of RNA. The mechanism of ribozyme action involves sequence-specific hybridization of the ribozyme molecule to complementary target RNA, followed by endonucleolytic cleavage. For example, engineered hammerhead motif ribozyme molecules may specifically and efficiently catalyze endonucleolytic cleavage of sequences encoding MEMAP.

Specific ribozyme cleavage sites within any potential RNA target are initially identified by scanning the target molecule for ribozyme cleavage sites, including the following sequences: GUA, GUU, and GUC. Once identified, short RNA sequences of between 15 and 20 ribonucleotides, corresponding to the region of the target gene containing the cleavage site, may be evaluated for secondary structural features which may render the oligonucleotide inoperable. The suitability of candidate targets may also be evaluated by testing accessibility to hybridization with complementary oligonucleotides using ribonuclease protection assays.

Complementary ribonucleic acid molecules and ribozymes of the invention may be prepared by any method known in the art for the synthesis of nucleic acid molecules. These include techniques for chemically synthesizing oligonucleotides such as solid phase phosphoramidite chemical synthesis. Alternatively, RNA molecules may be generated by in vitro and in vivo transcription of DNA sequences encoding MEMAP. Such DNA sequences may be incorporated into a wide variety of

vectors with suitable RNA polymerase promoters such as T7 or SP6. Alternatively, these cDNA constructs that synthesize complementary RNA, constitutively or inducibly, can be introduced into cell lines, cells, or tissues.

RNA molecules may be modified to increase intracellular stability and half-life. Possible
5 modifications include, but are not limited to, the addition of flanking sequences at the 5' and/or 3' ends of the molecule, or the use of phosphorothioate or 2' O-methyl rather than phosphodiesterase linkages within the backbone of the molecule. This concept is inherent in the production of PNAs and can be extended in all of these molecules by the inclusion of nontraditional bases such as inosine, queosine, and wybutosine, as well as acetyl-, methyl-, thio-, and similarly modified forms of adenine,
10 cytidine, guanine, thymine, and uridine which are not as easily recognized by endogenous endonucleases.

An additional embodiment of the invention encompasses a method for screening for a compound which is effective in altering expression of a polynucleotide encoding MEMAP. Compounds which may be effective in altering expression of a specific polynucleotide may include,
15 but are not limited to, oligonucleotides, antisense oligonucleotides, triple helix-forming oligonucleotides, transcription factors and other polypeptide transcriptional regulators, and non-macromolecular chemical entities which are capable of interacting with specific polynucleotide sequences. Effective compounds may alter polynucleotide expression by acting as either inhibitors or promoters of polynucleotide expression. Thus, in the treatment of disorders associated with increased
20 MEMAP expression or activity, a compound which specifically inhibits expression of the polynucleotide encoding MEMAP may be therapeutically useful, and in the treatment of disorders associated with decreased MEMAP expression or activity, a compound which specifically promotes expression of the polynucleotide encoding MEMAP may be therapeutically useful.

At least one, and up to a plurality, of test compounds may be screened for effectiveness in
25 altering expression of a specific polynucleotide. A test compound may be obtained by any method commonly known in the art, including chemical modification of a compound known to be effective in altering polynucleotide expression; selection from an existing, commercially-available or proprietary library of naturally-occurring or non-natural chemical compounds; rational design of a compound based on chemical and/or structural properties of the target polynucleotide; and selection from a
30 library of chemical compounds created combinatorially or randomly. A sample comprising a polynucleotide encoding MEMAP is exposed to at least one test compound thus obtained. The sample may comprise, for example, an intact or permeabilized cell, or an *in vitro* cell-free or reconstituted biochemical system. Alterations in the expression of a polynucleotide encoding MEMAP are assayed by any method commonly known in the art. Typically, the expression of a
35 specific nucleotide is detected by hybridization with a probe having a nucleotide sequence

complementary to the sequence of the polynucleotide encoding MEMAP. The amount of hybridization may be quantified, thus forming the basis for a comparison of the expression of the polynucleotide both with and without exposure to one or more test compounds. Detection of a change in the expression of a polynucleotide exposed to a test compound indicates that the test compound is effective in altering the expression of the polynucleotide. A screen for a compound effective in altering expression of a specific polynucleotide can be carried out, for example, using a Schizosaccharomyces pombe gene expression system (Atkins, D. et al. (1999) U.S. Patent No. 5,932,435; Arndt, G.M. et al. (2000) Nucleic Acids Res. 28:E15) or a human cell line such as HeLa cell (Clarke, M.L. et al. (2000) Biochem. Biophys. Res. Commun. 268:8-13). A particular embodiment of the present invention involves screening a combinatorial library of oligonucleotides (such as deoxyribonucleotides, ribonucleotides, peptide nucleic acids, and modified oligonucleotides) for antisense activity against a specific polynucleotide sequence (Bruice, T.W. et al. (1997) U.S. Patent No. 5,686,242; Bruice, T.W. et al. (2000) U.S. Patent No. 6,022,691).

Many methods for introducing vectors into cells or tissues are available and equally suitable for use in vivo, in vitro, and ex vivo. For ex vivo therapy, vectors may be introduced into stem cells taken from the patient and clonally propagated for autologous transplant back into that same patient. Delivery by transfection, by liposome injections, or by polycationic amino polymers may be achieved using methods which are well known in the art. (See, e.g., Goldman, C.K. et al. (1997) Nat. Biotechnol. 15:462-466.)

Any of the therapeutic methods described above may be applied to any subject in need of such therapy, including, for example, mammals such as humans, dogs, cats, cows, horses, rabbits, and monkeys.

An additional embodiment of the invention relates to the administration of a composition which generally comprises an active ingredient formulated with a pharmaceutically acceptable excipient. Excipients may include, for example, sugars, starches, celluloses, gums, and proteins. Various formulations are commonly known and are thoroughly discussed in the latest edition of Remington's Pharmaceutical Sciences (Maack Publishing, Easton PA). Such compositions may consist of MEMAP, antibodies to MEMAP, and mimetics, agonists, antagonists, or inhibitors of MEMAP.

The compositions utilized in this invention may be administered by any number of routes including, but not limited to, oral, intravenous, intramuscular, intra-arterial, intramedullary, intrathecal, intraventricular, pulmonary, transdermal, subcutaneous, intraperitoneal, intranasal, enteral, topical, sublingual, or rectal means.

Compositions for pulmonary administration may be prepared in liquid or dry powder form. These compositions are generally aerosolized immediately prior to inhalation by the patient. In the

case of small molecules (e.g. traditional low molecular weight organic drugs), aerosol delivery of fast-acting formulations is well-known in the art. In the case of macromolecules (e.g. larger peptides and proteins), recent developments in the field of pulmonary delivery via the alveolar region of the lung have enabled the practical delivery of drugs such as insulin to blood circulation (see, e.g., Patton, J.S. et al., U.S. Patent No. 5,997,848). Pulmonary delivery has the advantage of administration without needle injection, and obviates the need for potentially toxic penetration enhancers.

Compositions suitable for use in the invention include compositions wherein the active ingredients are contained in an effective amount to achieve the intended purpose. The determination of an effective dose is well within the capability of those skilled in the art.

Specialized forms of compositions may be prepared for direct intracellular delivery of macromolecules comprising MEMAP or fragments thereof. For example, liposome preparations containing a cell-impermeable macromolecule may promote cell fusion and intracellular delivery of the macromolecule. Alternatively, MEMAP or a fragment thereof may be joined to a short cationic N-terminal portion from the HIV Tat-1 protein. Fusion proteins thus generated have been found to transduce into the cells of all tissues, including the brain, in a mouse model system (Schwarze, S.R. et al. (1999) Science 285:1569-1572).

For any compound, the therapeutically effective dose can be estimated initially either in cell culture assays, e.g., of neoplastic cells, or in animal models such as mice, rats, rabbits, dogs, monkeys, or pigs. An animal model may also be used to determine the appropriate concentration range and route of administration. Such information can then be used to determine useful doses and routes for administration in humans.

A therapeutically effective dose refers to that amount of active ingredient, for example MEMAP or fragments thereof, antibodies of MEMAP, and agonists, antagonists or inhibitors of MEMAP, which ameliorates the symptoms or condition. Therapeutic efficacy and toxicity may be determined by standard pharmaceutical procedures in cell cultures or with experimental animals, such as by calculating the ED_{50} (the dose therapeutically effective in 50% of the population) or LD_{50} (the dose lethal to 50% of the population) statistics. The dose ratio of toxic to therapeutic effects is the therapeutic index, which can be expressed as the LD_{50}/ED_{50} ratio. Compositions which exhibit large therapeutic indices are preferred. The data obtained from cell culture assays and animal studies are used to formulate a range of dosage for human use. The dosage contained in such compositions is preferably within a range of circulating concentrations that includes the ED_{50} with little or no toxicity. The dosage varies within this range depending upon the dosage form employed, the sensitivity of the patient, and the route of administration.

The exact dosage will be determined by the practitioner, in light of factors related to the subject requiring treatment. Dosage and administration are adjusted to provide sufficient levels of the

active moiety or to maintain the desired effect. Factors which may be taken into account include the severity of the disease state, the general health of the subject, the age, weight, and gender of the subject, time and frequency of administration, drug combination(s), reaction sensitivities, and response to therapy. Long-acting compositions may be administered every 3 to 4 days, every week, or biweekly depending on the half-life and clearance rate of the particular formulation.

Normal dosage amounts may vary from about 0.1 μg to 100,000 μg , up to a total dose of about 1 gram, depending upon the route of administration. Guidance as to particular dosages and methods of delivery is provided in the literature and generally available to practitioners in the art. Those skilled in the art will employ different formulations for nucleotides than for proteins or their inhibitors. Similarly, delivery of polynucleotides or polypeptides will be specific to particular cells, conditions, locations, etc.

DIAGNOSTICS

In another embodiment, antibodies which specifically bind MEMAP may be used for the diagnosis of disorders characterized by expression of MEMAP, or in assays to monitor patients being treated with MEMAP or agonists, antagonists, or inhibitors of MEMAP. Antibodies useful for diagnostic purposes may be prepared in the same manner as described above for therapeutics. Diagnostic assays for MEMAP include methods which utilize the antibody and a label to detect MEMAP in human body fluids or in extracts of cells or tissues. The antibodies may be used with or without modification, and may be labeled by covalent or non-covalent attachment of a reporter molecule. A wide variety of reporter molecules, several of which are described above, are known in the art and may be used.

A variety of protocols for measuring MEMAP, including ELISAs, RIAs, and FACS, are known in the art and provide a basis for diagnosing altered or abnormal levels of MEMAP expression. Normal or standard values for MEMAP expression are established by combining body fluids or cell extracts taken from normal mammalian subjects, for example, human subjects, with antibody to MEMAP under conditions suitable for complex formation. The amount of standard complex formation may be quantitated by various methods, such as photometric means. Quantities of MEMAP expressed in subject, control, and disease samples from biopsied tissues are compared with the standard values. Deviation between standard and subject values establishes the parameters for diagnosing disease.

In another embodiment of the invention, the polynucleotides encoding MEMAP may be used for diagnostic purposes. The polynucleotides which may be used include oligonucleotide sequences, complementary RNA and DNA molecules, and PNAs. The polynucleotides may be used to detect and quantify gene expression in biopsied tissues in which expression of MEMAP may be correlated with disease. The diagnostic assay may be used to determine absence, presence, and excess

expression of MEMAP, and to monitor regulation of MEMAP levels during therapeutic intervention.

In one aspect, hybridization with PCR probes which are capable of detecting polynucleotide sequences, including genomic sequences, encoding MEMAP or closely related molecules may be used to identify nucleic acid sequences which encode MEMAP. The specificity of the probe, whether
 5 it is made from a highly specific region, e.g., the 5' regulatory region, or from a less specific region, e.g., a conserved motif, and the stringency of the hybridization or amplification will determine whether the probe identifies only naturally occurring sequences encoding MEMAP, allelic variants, or related sequences.

Probes may also be used for the detection of related sequences, and may have at least 50%
 10 sequence identity to any of the MEMAP encoding sequences. The hybridization probes of the subject invention may be DNA or RNA and may be derived from the sequence of SEQ ID NO:38-74 or from genomic sequences including promoters, enhancers, and introns of the MEMAP gene.

Means for producing specific hybridization probes for DNAs encoding MEMAP include the cloning of polynucleotide sequences encoding MEMAP or MEMAP derivatives into vectors for the
 15 production of mRNA probes. Such vectors are known in the art, are commercially available, and may be used to synthesize RNA probes *in vitro* by means of the addition of the appropriate RNA polymerases and the appropriate labeled nucleotides. Hybridization probes may be labeled by a variety of reporter groups, for example, by radionuclides such as ^{32}P or ^{35}S , or by enzymatic labels, such as alkaline phosphatase coupled to the probe via avidin/biotin coupling systems, and the like.

20 Polynucleotide sequences encoding MEMAP may be used for the diagnosis of disorders associated with expression of MEMAP. Examples of such disorders include, but are not limited to, a cell proliferative disorder such as actinic keratosis, arteriosclerosis, atherosclerosis, bursitis, cirrhosis, hepatitis, mixed connective tissue disease (MCTD), myelofibrosis, paroxysmal nocturnal hemoglobinuria, polycythemia vera, psoriasis, primary thrombocythemia, and cancers including
 25 adenocarcinoma, leukemia, lymphoma, melanoma, myeloma, sarcoma, teratocarcinoma, and, in particular, cancers of the adrenal gland, bladder, bone, bone marrow, brain, breast, cervix, gall bladder, ganglia, gastrointestinal tract, heart, kidney, liver, lung, muscle, ovary, pancreas, parathyroid, penis, prostate, salivary glands, skin, spleen, testis, thymus, thyroid, and uterus; an autoimmune/inflammatory disorder such as acquired immunodeficiency syndrome (AIDS),
 30 Addison's disease, adult respiratory distress syndrome, allergies, ankylosing spondylitis, amyloidosis, anemia, asthma, atherosclerosis, autoimmune hemolytic anemia, autoimmune thyroiditis, autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED), bronchitis, cholecystitis, contact dermatitis, Crohn's disease, atopic dermatitis, dermatomyositis, diabetes mellitus, emphysema, episodic lymphopenia with lymphocytotoxins, erythroblastosis fetalis,
 35 erythema nodosum, atrophic gastritis, glomerulonephritis, Goodpasture's syndrome, gout, Graves'

disease, Hashimoto's thyroiditis, hypereosinophilia, irritable bowel syndrome, multiple sclerosis, myasthenia gravis, myocardial or pericardial inflammation, osteoarthritis, osteoporosis, pancreatitis, polymyositis, psoriasis, Reiter's syndrome, rheumatoid arthritis, scleroderma, Sjögren's syndrome, systemic anaphylaxis, systemic lupus erythematosus, systemic sclerosis, thrombocytopenic purpura, ulcerative colitis, uveitis, Werner syndrome, complications of cancer, hemodialysis, and

5 extracorporeal circulation, viral, bacterial, fungal, parasitic, protozoal, and helminthic infections, and trauma; a neurological disorder such as epilepsy, ischemic cerebrovascular disease, stroke, cerebral neoplasms, Alzheimer's disease, Pick's disease, Huntington's disease, dementia, Parkinson's disease and other extrapyramidal disorders, amyotrophic lateral sclerosis and other motor neuron disorders,

10 progressive neural muscular atrophy, retinitis pigmentosa, hereditary ataxias, multiple sclerosis and other demyelinating diseases, bacterial and viral meningitis, brain abscess, subdural empyema, epidural abscess, suppurative intracranial thrombophlebitis, myelitis and radiculitis, viral central nervous system disease, prion diseases including kuru, Creutzfeldt-Jakob disease, and Gerstmann-Straussler-Scheinker syndrome, fatal familial insomnia, nutritional and metabolic diseases of the

15 nervous system, neurofibromatosis, tuberous sclerosis, cerebelloretinal hemangioblastomatosis, encephalotrigeminal syndrome, mental retardation and other developmental disorders of the central nervous system, cerebral palsy, neuroskeletal disorders, autonomic nervous system disorders, cranial nerve disorders, spinal cord diseases, muscular dystrophy and other neuromuscular disorders, peripheral nervous system disorders, dermatomyositis and polymyositis, inherited, metabolic,

20 endocrine, and toxic myopathies, myasthenia gravis, periodic paralysis, mental disorders including mood, anxiety, and schizophrenic disorders, seasonal affective disorder (SAD), akathisia, amnesia, catatonia, diabetic neuropathy, tardive dyskinesia, dystonias, paranoid psychoses, postherpetic neuralgia, Tourette's disorder, progressive supranuclear palsy, corticobasal degeneration, and familial frontotemporal dementia; and a gastrointestinal disorder such as dysphagia, peptic esophagitis,

25 esophageal spasm, esophageal stricture, esophageal carcinoma, dyspepsia, indigestion, gastritis, gastric carcinoma, anorexia, nausea, emesis, gastroparesis, antral or pyloric edema, abdominal angina, pyrosis, gastroenteritis, intestinal obstruction, infections of the intestinal tract, peptic ulcer, cholelithiasis, cholecystitis, cholestasis, pancreatitis, pancreatic carcinoma, biliary tract disease, hepatitis, hyperbilirubinemia, cirrhosis, passive congestion of the liver, hepatoma, infectious colitis,

30 ulcerative colitis, ulcerative proctitis, Crohn's disease, Whipple's disease, Mallory-Weiss syndrome, colonic carcinoma, colonic obstruction, irritable bowel syndrome, short bowel syndrome, diarrhea, constipation, gastrointestinal hemorrhage, acquired immunodeficiency syndrome (AIDS) enteropathy, jaundice, hepatic encephalopathy, hepatorenal syndrome, hepatic steatosis, hemochromatosis, Wilson's disease, alpha₁-antitrypsin deficiency, Reye's syndrome, primary

35 sclerosing cholangitis, liver infarction, portal vein obstruction and thrombosis, centrilobular necrosis,

peliosis hepatitis, hepatic vein thrombosis, veno-occlusive disease, preeclampsia, eclampsia, acute fatty liver of pregnancy, intrahepatic cholestasis of pregnancy, and hepatic tumors including nodular hyperplasias, adenomas, and carcinomas. The polynucleotide sequences encoding MEMAP may be used in Southern or northern analysis, dot blot, or other membrane-based technologies; in PCR
5 technologies; in dipstick, pin, and multiformat ELISA-like assays; and in microarrays utilizing fluids or tissues from patients to detect altered MEMAP expression. Such qualitative or quantitative methods are well known in the art.

In a particular aspect, the nucleotide sequences encoding MEMAP may be useful in assays that detect the presence of associated disorders, particularly those mentioned above. The nucleotide
10 sequences encoding MEMAP may be labeled by standard methods and added to a fluid or tissue sample from a patient under conditions suitable for the formation of hybridization complexes. After a suitable incubation period, the sample is washed and the signal is quantified and compared with a standard value. If the amount of signal in the patient sample is significantly altered in comparison to a control sample then the presence of altered levels of nucleotide sequences encoding MEMAP in the
15 sample indicates the presence of the associated disorder. Such assays may also be used to evaluate the efficacy of a particular therapeutic treatment regimen in animal studies, in clinical trials, or to monitor the treatment of an individual patient.

In order to provide a basis for the diagnosis of a disorder associated with expression of MEMAP, a normal or standard profile for expression is established. This may be accomplished by
20 combining body fluids or cell extracts taken from normal subjects, either animal or human, with a sequence, or a fragment thereof, encoding MEMAP, under conditions suitable for hybridization or amplification. Standard hybridization may be quantified by comparing the values obtained from normal subjects with values from an experiment in which a known amount of a substantially purified polynucleotide is used. Standard values obtained in this manner may be compared with values
25 obtained from samples from patients who are symptomatic for a disorder. Deviation from standard values is used to establish the presence of a disorder.

Once the presence of a disorder is established and a treatment protocol is initiated, hybridization assays may be repeated on a regular basis to determine if the level of expression in the patient begins to approximate that which is observed in the normal subject. The results obtained from
30 successive assays may be used to show the efficacy of treatment over a period ranging from several days to months.

With respect to cancer, the presence of an abnormal amount of transcript (either under- or overexpressed) in biopsied tissue from an individual may indicate a predisposition for the development of the disease, or may provide a means for detecting the disease prior to the appearance
35 of actual clinical symptoms. A more definitive diagnosis of this type may allow health professionals

to employ preventative measures or aggressive treatment earlier thereby preventing the development or further progression of the cancer.

Additional diagnostic uses for oligonucleotides designed from the sequences encoding MEMAP may involve the use of PCR. These oligomers may be chemically synthesized, generated enzymatically, or produced in vitro. Oligomers will preferably contain a fragment of a polynucleotide encoding MEMAP, or a fragment of a polynucleotide complementary to the polynucleotide encoding MEMAP, and will be employed under optimized conditions for identification of a specific gene or condition. Oligomers may also be employed under less stringent conditions for detection or quantification of closely related DNA or RNA sequences.

In a particular aspect, oligonucleotide primers derived from the polynucleotide sequences encoding MEMAP may be used to detect single nucleotide polymorphisms (SNPs). SNPs are substitutions, insertions and deletions that are a frequent cause of inherited or acquired genetic disease in humans. Methods of SNP detection include, but are not limited to, single-stranded conformation polymorphism (SSCP) and fluorescent SSCP (fSSCP) methods. In SSCP, oligonucleotide primers derived from the polynucleotide sequences encoding MEMAP are used to amplify DNA using the polymerase chain reaction (PCR). The DNA may be derived, for example, from diseased or normal tissue, biopsy samples, bodily fluids, and the like. SNPs in the DNA cause differences in the secondary and tertiary structures of PCR products in single-stranded form, and these differences are detectable using gel electrophoresis in non-denaturing gels. In fSSCP, the oligonucleotide primers are fluorescently labeled, which allows detection of the amplimers in high-throughput equipment such as DNA sequencing machines. Additionally, sequence database analysis methods, termed *in silico* SNP (isSNP), are capable of identifying polymorphisms by comparing the sequence of individual overlapping DNA fragments which assemble into a common consensus sequence. These computer-based methods filter out sequence variations due to laboratory preparation of DNA and sequencing errors using statistical models and automated analyses of DNA sequence chromatograms. In the alternative, SNPs may be detected and characterized by mass spectrometry using, for example, the high throughput MASSARRAY system (Sequenom, Inc., San Diego CA).

Methods which may also be used to quantify the expression of MEMAP include radiolabeling or biotinylating nucleotides, coamplification of a control nucleic acid, and interpolating results from standard curves. (See, e.g., Melby, P.C. et al. (1993) J. Immunol. Methods 159:235-244; Duplaa, C. et al. (1993) Anal. Biochem. 212:229-236.) The speed of quantitation of multiple samples may be accelerated by running the assay in a high-throughput format where the oligomer or polynucleotide of interest is presented in various dilutions and a spectrophotometric or colorimetric response gives rapid quantitation.

In further embodiments, oligonucleotides or longer fragments derived from any of the

polynucleotide sequences described herein may be used as elements on a microarray. The microarray can be used in transcript imaging techniques which monitor the relative expression levels of large numbers of genes simultaneously as described in Seilhamer, J.J. et al., "Comparative Gene Transcript Analysis," U.S. Patent No. 5,840,484, incorporated herein by reference. The microarray may also be
5 used to identify genetic variants, mutations, and polymorphisms. This information may be used to determine gene function, to understand the genetic basis of a disorder, to diagnose a disorder, to monitor progression/regression of disease as a function of gene expression, and to develop and monitor the activities of therapeutic agents in the treatment of disease. In particular, this information may be used to develop a pharmacogenomic profile of a patient in order to select the most appropriate
10 and effective treatment regimen for that patient. For example, therapeutic agents which are highly effective and display the fewest side effects may be selected for a patient based on his/her pharmacogenomic profile.

In another embodiment, antibodies specific for MEMAP, or MEMAP or fragments thereof may be used as elements on a microarray. The microarray may be used to monitor or measure
15 protein-protein interactions, drug-target interactions, and gene expression profiles, as described above.

A particular embodiment relates to the use of the polynucleotides of the present invention to generate a transcript image of a tissue or cell type. A transcript image represents the global pattern of gene expression by a particular tissue or cell type. Global gene expression patterns are analyzed by
20 quantifying the number of expressed genes and their relative abundance under given conditions and at a given time. (See Seilhamer et al., "Comparative Gene Transcript Analysis," U.S. Patent Number 5,840,484, expressly incorporated by reference herein.) Thus a transcript image may be generated by hybridizing the polynucleotides of the present invention or their complements to the totality of transcripts or reverse transcripts of a particular tissue or cell type. In one embodiment, the
25 hybridization takes place in high-throughput format, wherein the polynucleotides of the present invention or their complements comprise a subset of a plurality of elements on a microarray. The resultant transcript image would provide a profile of gene activity.

Transcript images may be generated using transcripts isolated from tissues, cell lines, biopsies, or other biological samples. The transcript image may thus reflect gene expression in vivo,
30 as in the case of a tissue or biopsy sample, or in vitro, as in the case of a cell line.

Transcript images which profile the expression of the polynucleotides of the present invention may also be used in conjunction with in vitro model systems and preclinical evaluation of pharmaceuticals, as well as toxicological testing of industrial and naturally-occurring environmental compounds. All compounds induce characteristic gene expression patterns, frequently termed
35 molecular fingerprints or toxicant signatures, which are indicative of mechanisms of action and

toxicity (Nuwaysir, E.F. et al. (1999) Mol. Carcinog. 24:153-159; Steiner, S. and N.L. Anderson (2000) Toxicol. Lett. 112-113:467-471, expressly incorporated by reference herein). If a test compound has a signature similar to that of a compound with known toxicity, it is likely to share those toxic properties. These fingerprints or signatures are most useful and refined when they contain expression information from a large number of genes and gene families. Ideally, a genome-wide measurement of expression provides the highest quality signature. Even genes whose expression is not altered by any tested compounds are important as well, as the levels of expression of these genes are used to normalize the rest of the expression data. The normalization procedure is useful for comparison of expression data after treatment with different compounds. While the assignment of gene function to elements of a toxicant signature aids in interpretation of toxicity mechanisms, knowledge of gene function is not necessary for the statistical matching of signatures which leads to prediction of toxicity. (See, for example, Press Release 00-02 from the National Institute of Environmental Health Sciences, released February 29, 2000, available at <http://www.niehs.nih.gov/oc/news/toxchip.htm>.) Therefore, it is important and desirable in toxicological screening using toxicant signatures to include all expressed gene sequences.

In one embodiment, the toxicity of a test compound is assessed by treating a biological sample containing nucleic acids with the test compound. Nucleic acids that are expressed in the treated biological sample are hybridized with one or more probes specific to the polynucleotides of the present invention, so that transcript levels corresponding to the polynucleotides of the present invention may be quantified. The transcript levels in the treated biological sample are compared with levels in an untreated biological sample. Differences in the transcript levels between the two samples are indicative of a toxic response caused by the test compound in the treated sample.

Another particular embodiment relates to the use of the polypeptide sequences of the present invention to analyze the proteome of a tissue or cell type. The term proteome refers to the global pattern of protein expression in a particular tissue or cell type. Each protein component of a proteome can be subjected individually to further analysis. Proteome expression patterns, or profiles, are analyzed by quantifying the number of expressed proteins and their relative abundance under given conditions and at a given time. A profile of a cell's proteome may thus be generated by separating and analyzing the polypeptides of a particular tissue or cell type. In one embodiment, the separation is achieved using two-dimensional gel electrophoresis, in which proteins from a sample are separated by isoelectric focusing in the first dimension, and then according to molecular weight by sodium dodecyl sulfate slab gel electrophoresis in the second dimension (Steiner and Anderson, *supra*). The proteins are visualized in the gel as discrete and uniquely positioned spots, typically by staining the gel with an agent such as Coomassie Blue or silver or fluorescent stains. The optical density of each protein spot is generally proportional to the level of the protein in the sample. The

optical densities of equivalently positioned protein spots from different samples, for example, from biological samples either treated or untreated with a test compound or therapeutic agent, are compared to identify any changes in protein spot density related to the treatment. The proteins in the spots are partially sequenced using, for example, standard methods employing chemical or enzymatic cleavage followed by mass spectrometry. The identity of the protein in a spot may be determined by comparing its partial sequence, preferably of at least 5 contiguous amino acid residues, to the polypeptide sequences of the present invention. In some cases, further sequence data may be obtained for definitive protein identification.

A proteomic profile may also be generated using antibodies specific for MEMAP to quantify the levels of MEMAP expression. In one embodiment, the antibodies are used as elements on a microarray, and protein expression levels are quantified by exposing the microarray to the sample and detecting the levels of protein bound to each array element (Lueking, A. et al. (1999) *Anal. Biochem.* 270:103-111; Mendoz, L.G. et al. (1999) *Biotechniques* 27:778-788). Detection may be performed by a variety of methods known in the art, for example, by reacting the proteins in the sample with a thiol- or amino-reactive fluorescent compound and detecting the amount of fluorescence bound at each array element.

Toxicant signatures at the proteome level are also useful for toxicological screening, and should be analyzed in parallel with toxicant signatures at the transcript level. There is a poor correlation between transcript and protein abundances for some proteins in some tissues (Anderson, N.L. and J. Seilhamer (1997) *Electrophoresis* 18:533-537), so proteome toxicant signatures may be useful in the analysis of compounds which do not significantly affect the transcript image, but which alter the proteomic profile. In addition, the analysis of transcripts in body fluids is difficult, due to rapid degradation of mRNA, so proteomic profiling may be more reliable and informative in such cases.

In another embodiment, the toxicity of a test compound is assessed by treating a biological sample containing proteins with the test compound. Proteins that are expressed in the treated biological sample are separated so that the amount of each protein can be quantified. The amount of each protein is compared to the amount of the corresponding protein in an untreated biological sample. A difference in the amount of protein between the two samples is indicative of a toxic response to the test compound in the treated sample. Individual proteins are identified by sequencing the amino acid residues of the individual proteins and comparing these partial sequences to the polypeptides of the present invention.

In another embodiment, the toxicity of a test compound is assessed by treating a biological sample containing proteins with the test compound. Proteins from the biological sample are incubated with antibodies specific to the polypeptides of the present invention. The amount of

protein recognized by the antibodies is quantified. The amount of protein in the treated biological sample is compared with the amount in an untreated biological sample. A difference in the amount of protein between the two samples is indicative of a toxic response to the test compound in the treated sample.

- 5 Microarrays may be prepared, used, and analyzed using methods known in the art. (See, e.g., Brennan, T.M. et al. (1995) U.S. Patent No. 5,474,796; Schena, M. et al. (1996) Proc. Natl. Acad. Sci. USA 93:10614-10619; Baldeschweiler et al. (1995) PCT application WO95/251116; Shalon, D. et al. (1995) PCT application WO95/35505; Heller, R.A. et al. (1997) Proc. Natl. Acad. Sci. USA 94:2150-2155; and Heller, M.J. et al. (1997) U.S. Patent No. 5,605,662.) Various types of microarrays are
10 well known and thoroughly described in DNA Microarrays: A Practical Approach, M. Schena, ed. (1999) Oxford University Press, London, hereby expressly incorporated by reference.

- In another embodiment of the invention, nucleic acid sequences encoding MEMAP may be used to generate hybridization probes useful in mapping the naturally occurring genomic sequence. Either coding or noncoding sequences may be used, and in some instances, noncoding sequences may
15 be preferable over coding sequences. For example, conservation of a coding sequence among members of a multi-gene family may potentially cause undesired cross hybridization during chromosomal mapping. The sequences may be mapped to a particular chromosome, to a specific region of a chromosome, or to artificial chromosome constructions, e.g., human artificial chromosomes (HACs), yeast artificial chromosomes (YACs), bacterial artificial chromosomes
20 (BACs), bacterial P1 constructions, or single chromosome cDNA libraries. (See, e.g., Harrington, J.J. et al. (1997) Nat. Genet. 15:345-355; Price, C.M. (1993) Blood Rev. 7:127-134; and Trask, B.J. (1991) Trends Genet. 7:149-154.) Once mapped, the nucleic acid sequences of the invention may be used to develop genetic linkage maps, for example, which correlate the inheritance of a disease state with the inheritance of a particular chromosome region or restriction fragment length polymorphism
25 (RFLP). (See, e.g., Lander, E.S. and D. Botstein (1986) Proc. Natl. Acad. Sci. USA 83:7353-7357.)

- Fluorescent in situ hybridization (FISH) may be correlated with other physical and genetic map data. (See, e.g., Heinz-Ulrich, et al. (1995) in Meyers, supra, pp. 965-968.) Examples of genetic map data can be found in various scientific journals or at the Online Mendelian Inheritance in Man (OMIM) World Wide Web site. Correlation between the location of the gene encoding MEMAP on a
30 physical map and a specific disorder, or a predisposition to a specific disorder, may help define the region of DNA associated with that disorder and thus may further positional cloning efforts.

- In situ hybridization of chromosomal preparations and physical mapping techniques, such as linkage analysis using established chromosomal markers, may be used for extending genetic maps. Often the placement of a gene on the chromosome of another mammalian species, such as mouse,
35 may reveal associated markers even if the exact chromosomal locus is not known. This information is

valuable to investigators searching for disease genes using positional cloning or other gene discovery techniques. Once the gene or genes responsible for a disease or syndrome have been crudely localized by genetic linkage to a particular genomic region, e.g., ataxia-telangiectasia to 11q22-23, any sequences mapping to that area may represent associated or regulatory genes for further investigation. (See, e.g., Gatti, R.A. et al. (1988) Nature 336:577-580.) The nucleotide sequence of the instant invention may also be used to detect differences in the chromosomal location due to translocation, inversion, etc., among normal, carrier, or affected individuals.

In another embodiment of the invention, MEMAP, its catalytic or immunogenic fragments, or oligopeptides thereof can be used for screening libraries of compounds in any of a variety of drug screening techniques. The fragment employed in such screening may be free in solution, affixed to a solid support, borne on a cell surface, or located intracellularly. The formation of binding complexes between MEMAP and the agent being tested may be measured.

Another technique for drug screening provides for high throughput screening of compounds having suitable binding affinity to the protein of interest. (See, e.g., Geysen, et al. (1984) PCT application WO84/03564.) In this method, large numbers of different small test compounds are synthesized on a solid substrate. The test compounds are reacted with MEMAP, or fragments thereof, and washed. Bound MEMAP is then detected by methods well known in the art. Purified MEMAP can also be coated directly onto plates for use in the aforementioned drug screening techniques. Alternatively, non-neutralizing antibodies can be used to capture the peptide and immobilize it on a solid support.

In another embodiment, one may use competitive drug screening assays in which neutralizing antibodies capable of binding MEMAP specifically compete with a test compound for binding MEMAP. In this manner, antibodies can be used to detect the presence of any peptide which shares one or more antigenic determinants with MEMAP.

In additional embodiments, the nucleotide sequences which encode MEMAP may be used in any molecular biology techniques that have yet to be developed, provided the new techniques rely on properties of nucleotide sequences that are currently known, including, but not limited to, such properties as the triplet genetic code and specific base pair interactions.

Without further elaboration, it is believed that one skilled in the art can, using the preceding description, utilize the present invention to its fullest extent. The following preferred specific embodiments are, therefore, to be construed as merely illustrative, and not limitative of the remainder of the disclosure in any way whatsoever.

The disclosures of all patents, applications, and publications mentioned above and below, in particular U.S. Ser. No. 60/149,641 and U.S. Ser. No. 60/164,203 are hereby expressly incorporated by reference.

EXAMPLES

I. Construction of cDNA Libraries

RNA was purchased from Clontech or isolated from tissues described in Table 4. Some tissues were homogenized and lysed in guanidinium isothiocyanate, while others were homogenized and lysed in phenol or in a suitable mixture of denaturants, such as TRIZOL (Life Technologies), a monophasic solution of phenol and guanidine isothiocyanate. The resulting lysates were centrifuged over CsCl cushions or extracted with chloroform. RNA was precipitated from the lysates with either isopropanol or sodium acetate and ethanol, or by other routine methods.

Phenol extraction and precipitation of RNA were repeated as necessary to increase RNA purity. In some cases, RNA was treated with DNase. For most libraries, poly(A⁺) RNA was isolated using oligo d(T)-coupled paramagnetic particles (Promega), OLIGOTEX latex particles (QIAGEN, Chatsworth CA), or an OLIGOTEX mRNA purification kit (QIAGEN). Alternatively, RNA was isolated directly from tissue lysates using other RNA isolation kits, e.g., the POLY(A)PURE mRNA purification kit (Ambion, Austin TX).

In some cases, Stratagene was provided with RNA and constructed the corresponding cDNA libraries. Otherwise, cDNA was synthesized and cDNA libraries were constructed with the UNIZAP vector system (Stratagene) or SUPERScript plasmid system (Life Technologies), using the recommended procedures or similar methods known in the art. (See, e.g., Ausubel, 1997, supra, units 5.1-6.6.) Reverse transcription was initiated using oligo d(T) or random primers. Synthetic oligonucleotide adapters were ligated to double stranded cDNA, and the cDNA was digested with the appropriate restriction enzyme or enzymes. For most libraries, the cDNA was size-selected (300-1000 bp) using SEPHACRYL S1000, SEPHAROSE CL2B, or SEPHAROSE CL4B column chromatography (Amersham Pharmacia Biotech) or preparative agarose gel electrophoresis. cDNAs were ligated into compatible restriction enzyme sites of the polylinker of a suitable plasmid, e.g., PBLUESCRIPT plasmid (Stratagene), PSPORT1 plasmid (Life Technologies), pcDNA2.1 plasmid (Invitrogen, Carlsbad CA), or pINCY plasmid (Incyte Genomics, Palo Alto CA). Recombinant plasmids were transformed into competent *E. coli* cells including XL1-Blue, XL1-BlueMRF, or SOLR from Stratagene or DH5 α , DH10B, or ElectroMAX DH10B from Life Technologies.

II. Isolation of cDNA Clones

Plasmids obtained as described in Example I were recovered from host cells by in vivo excision using the UNIZAP vector system (Stratagene) or by cell lysis. Plasmids were purified using at least one of the following: a Magic or WIZARD Minipreps DNA purification system (Promega); an AGTC Miniprep purification kit (Edge Biosystems, Gaithersburg MD); and QIAWELL 8 Plasmid, QIAWELL 8 Plus Plasmid, QIAWELL 8 Ultra Plasmid purification systems or the R.E.A.L. PREP 96 plasmid purification kit from QIAGEN. Following precipitation, plasmids were resuspended in 0.1

ml of distilled water and stored, with or without lyophilization, at 4°C.

Alternatively, plasmid DNA was amplified from host cell lysates using direct link PCR in a high-throughput format (Rao, V.B. (1994) Anal. Biochem. 216:1-14). Host cell lysis and thermal cycling steps were carried out in a single reaction mixture. Samples were processed and stored in 384-well plates, and the concentration of amplified plasmid DNA was quantified fluorometrically using PICOGREEN dye (Molecular Probes, Eugene OR) and a FLUOROSKAN II fluorescence scanner (Labsystems Oy, Helsinki, Finland).

III. Sequencing and Analysis

Incyte cDNA recovered in plasmids as described in Example II were sequenced as follows.

Sequencing reactions were processed using standard methods or high-throughput instrumentation such as the ABI CATALYST 800 (PE Biosystems) thermal cycler or the PTC-200 thermal cycler (MJ Research) in conjunction with the HYDRA microdispenser (Robbins Scientific) or the MICROLAB 2200 (Hamilton) liquid transfer system. cDNA sequencing reactions were prepared using reagents provided by Amersham Pharmacia Biotech or supplied in ABI sequencing kits such as the ABI PRISM BIGDYE Terminator cycle sequencing ready reaction kit (PE Biosystems). Electrophoretic separation of cDNA sequencing reactions and detection of labeled polynucleotides were carried out using the MEGABACE 1000 DNA sequencing system (Molecular Dynamics); the ABI PRISM 373 or 377 sequencing system (PE Biosystems) in conjunction with standard ABI protocols and base calling software; or other sequence analysis systems known in the art. Reading frames within the cDNA sequences were identified using standard methods (reviewed in Ausubel, 1997, supra, unit 7.7). Some of the cDNA sequences were selected for extension using the techniques disclosed in Example VI.

The polynucleotide sequences derived from cDNA sequencing were assembled and analyzed using a combination of software programs which utilize algorithms well known to those skilled in the art. Table 5 summarizes the tools, programs, and algorithms used and provides applicable descriptions, references, and threshold parameters. The first column of Table 5 shows the tools, programs, and algorithms used, the second column provides brief descriptions thereof, the third column presents appropriate references, all of which are incorporated by reference herein in their entirety, and the fourth column presents, where applicable, the scores, probability values, and other parameters used to evaluate the strength of a match between two sequences (the higher the score, the greater the homology between two sequences). Sequences were analyzed using MACDNASIS PRO software (Hitachi Software Engineering, South San Francisco CA) and LASERGENE software (DNASTAR). Polynucleotide and polypeptide sequence alignments were generated using the default parameters specified by the clustal algorithm as incorporated into the MEGALIGN multisequence alignment program (DNASTAR), which also calculates the percent identity between aligned

sequences.

The polynucleotide sequences were validated by removing vector, linker, and polyA sequences and by masking ambiguous bases, using algorithms and programs based on BLAST, dynamic programming, and dinucleotide nearest neighbor analysis. The sequences were then queried against a selection of public databases such as the GenBank primate, rodent, mammalian, vertebrate, and eukaryote databases, and BLOCKS, PRINTS, DOMO, PRODOM, and PFAM to acquire annotation using programs based on BLAST, FASTA, and BLIMPS. The sequences were assembled into full length polynucleotide sequences using programs based on Phred, Phrap, and Consed, and were screened for open reading frames using programs based on GeneMark, BLAST, and FASTA.

The full length polynucleotide sequences were translated to derive the corresponding full length amino acid sequences, and these full length sequences were subsequently analyzed by querying against databases such as the GenBank databases (described above), SwissProt, BLOCKS, PRINTS, DOMO, PRODOM, Prosite, and Hidden Markov Model (HMM)-based protein family databases such as PFAM. HMM is a probabilistic approach which analyzes consensus primary structures of gene families. (See, e.g., Eddy, S.R. (1996) Curr. Opin. Struct. Biol. 6:361-365.)

The programs described above for the assembly and analysis of full length polynucleotide and amino acid sequences were also used to identify polynucleotide sequence fragments from SEQ ID NO:38-74. Fragments from about 20 to about 4000 nucleotides which are useful in hybridization and amplification technologies were described in The Invention section above.

IV. Analysis of Polynucleotide Expression

Northern analysis is a laboratory technique used to detect the presence of a transcript of a gene and involves the hybridization of a labeled nucleotide sequence to a membrane on which RNAs from a particular cell type or tissue have been bound. (See, e.g., Sambrook, supra, ch. 7; Ausubel, 1995, supra, ch. 4 and 16.)

Analogous computer techniques applying BLAST were used to search for identical or related molecules in cDNA databases such as GenBank or LIFESEQ (Incyte Genomics). This analysis is much faster than multiple membrane-based hybridizations. In addition, the sensitivity of the computer search can be modified to determine whether any particular match is categorized as exact or similar. The basis of the search is the product score, which is defined as:

$$\frac{\text{BLAST Score} \times \text{Percent Identity}}{5 \times \text{minimum} \{ \text{length}(\text{Seq. 1}), \text{length}(\text{Seq. 2}) \}}$$

The product score takes into account both the degree of similarity between two sequences and the length of the sequence match. The product score is a normalized value between 0 and 100, and is calculated as follows: the BLAST score is multiplied by the percent nucleotide identity and the

product is divided by (5 times the length of the shorter of the two sequences). The BLAST score is calculated by assigning a score of +5 for every base that matches in a high-scoring segment pair (HSP), and -4 for every mismatch. Two sequences may share more than one HSP (separated by gaps). If there is more than one HSP, then the pair with the highest BLAST score is used to calculate the product score. The product score represents a balance between fractional overlap and quality in a BLAST alignment. For example, a product score of 100 is produced only for 100% identity over the entire length of the shorter of the two sequences being compared. A product score of 70 is produced either by 100% identity and 70% overlap at one end, or by 88% identity and 100% overlap at the other. A product score of 50 is produced either by 100% identity and 50% overlap at one end, or 79% identity and 100% overlap.

The results of northern analyses are reported as a percentage distribution of libraries in which the transcript encoding MEMAP occurred. Analysis involved the categorization of cDNA libraries by organ/tissue and disease. The organ/tissue categories included cardiovascular, dermatologic, developmental, endocrine, gastrointestinal, hematopoietic/immune, musculoskeletal, nervous, reproductive, and urologic. The disease/condition categories included cancer, inflammation, trauma, cell proliferation, neurological, and pooled. For each category, the number of libraries expressing the sequence of interest was counted and divided by the total number of libraries across all categories. Percentage values of tissue-specific and disease- or condition-specific expression are reported in Table 3.

V. Chromosomal Mapping of MEMAP Encoding Polynucleotides

The cDNA sequences which were used to assemble SEQ ID NO:38-74 were compared with sequences from the Incyte LIFESEQ database and public domain databases using BLAST and other implementations of the Smith-Waterman algorithm. Sequences from these databases that matched SEQ ID NO:38-74 were assembled into clusters of contiguous and overlapping sequences using assembly algorithms such as Phrap (Table 5). Radiation hybrid and genetic mapping data available from public resources such as the Stanford Human Genome Center (SHGC), Whitehead Institute for Genome Research (WIGR), and Génethon were used to determine if any of the clustered sequences had been previously mapped. Inclusion of a mapped sequence in a cluster resulted in the assignment of all sequences of that cluster, including its particular SEQ ID NO., to that map location.

The genetic map locations of SEQ ID NO:38, SEQ ID NO:39, SEQ ID NO:42, SEQ ID NO:44, SEQ ID NO:60, SEQ ID NO:63, and SEQ ID NO:67 are described in The Invention as ranges, or intervals, of human chromosomes. More than one map location is reported for SEQ ID NO:38, SEQ ID NO:39, SEQ ID NO:44, SEQ ID NO:60, and SEQ ID NO:63, indicating that previously mapped sequences having similarity, but not complete identity, to SEQ ID NO:38, SEQ ID NO:39, SEQ ID NO:44, SEQ ID NO:60, and SEQ ID NO:63 were assembled into their respective

clusters. The map position of an interval, in centiMorgans, is measured relative to the terminus of the chromosome's p-arm. (The centiMorgan (cM) is a unit of measurement based on recombination frequencies between chromosomal markers. On average, 1 cM is roughly equivalent to 1 megabase (Mb) of DNA in humans, although this can vary widely due to hot and cold spots of recombination.)

5 The cM distances are based on genetic markers mapped by Généthon which provide boundaries for radiation hybrid markers whose sequences were included in each of the clusters. Diseases associated with the public and Incyte sequences located within the indicated intervals are also reported in the Invention where applicable. Human genome maps and other resources available to the public, such as the NCBI "GeneMap'99" World Wide Web site (<http://www.ncbi.nlm.nih.gov/genemap/>), can be

10 employed to determine if previously identified disease genes map within or in proximity to the intervals indicated above.

VI. Extension of MEMAP Encoding Polynucleotides

The full length nucleic acid sequences of SEQ ID NO:38-74 were produced by extension of an appropriate fragment of the full length molecule using oligonucleotide primers designed from this

15 fragment. One primer was synthesized to initiate 5' extension of the known fragment, and the other primer, to initiate 3' extension of the known fragment. The initial primers were designed using OLIGO 4.06 software (National Biosciences), or another appropriate program, to be about 22 to 30 nucleotides in length, to have a GC content of about 50% or more, and to anneal to the target sequence at temperatures of about 68°C to about 72°C. Any stretch of nucleotides which would

20 result in hairpin structures and primer-primer dimerizations was avoided.

Selected human cDNA libraries were used to extend the sequence. If more than one extension was necessary or desired, additional or nested sets of primers were designed.

High fidelity amplification was obtained by PCR using methods well known in the art. PCR was performed in 96-well plates using the PTC-200 thermal cycler (MJ Research, Inc.). The reaction

25 mix contained DNA template, 200 nmol of each primer, reaction buffer containing Mg^{2+} , $(NH_4)_2SO_4$, and β -mercaptoethanol, Taq DNA polymerase (Amersham Pharmacia Biotech), ELONGASE enzyme (Life Technologies), and Pfu DNA polymerase (Stratagene), with the following parameters for primer pair PCI A and PCI B: Step 1: 94°C, 3 min; Step 2: 94°C, 15 sec; Step 3: 60°C, 1 min; Step 4: 68°C, 2 min; Step 5: Steps 2, 3, and 4 repeated 20 times; Step 6: 68°C, 5 min; Step 7: storage at 4°C. In the

30 alternative, the parameters for primer pair T7 and SK+ were as follows: Step 1: 94°C, 3 min; Step 2: 94°C, 15 sec; Step 3: 57°C, 1 min; Step 4: 68°C, 2 min; Step 5: Steps 2, 3, and 4 repeated 20 times; Step 6: 68°C, 5 min; Step 7: storage at 4°C.

The concentration of DNA in each well was determined by dispensing 100 μ l PICOGREEN quantitation reagent (0.25% (v/v) PICOGREEN; Molecular Probes, Eugene OR) dissolved in 1X TE

35 and 0.5 μ l of undiluted PCR product into each well of an opaque fluorimeter plate (Corning Costar,

Acton MA), allowing the DNA to bind to the reagent. The plate was scanned in a Fluoroskan II (Labsystems Oy, Helsinki, Finland) to measure the fluorescence of the sample and to quantify the concentration of DNA. A 5 μ l to 10 μ l aliquot of the reaction mixture was analyzed by electrophoresis on a 1 % agarose mini-gel to determine which reactions were successful in extending the sequence.

The extended nucleotides were desalted and concentrated, transferred to 384-well plates, digested with CviJI cholera virus endonuclease (Molecular Biology Research, Madison WI), and sonicated or sheared prior to religation into pUC 18 vector (Amersham Pharmacia Biotech). For shotgun sequencing, the digested nucleotides were separated on low concentration (0.6 to 0.8%) agarose gels, fragments were excised, and agar digested with Agar ACE (Promega). Extended clones were religated using T4 ligase (New England Biolabs, Beverly MA) into pUC 18 vector (Amersham Pharmacia Biotech), treated with Pfu DNA polymerase (Stratagene) to fill-in restriction site overhangs, and transfected into competent *E. coli* cells. Transformed cells were selected on antibiotic-containing media, and individual colonies were picked and cultured overnight at 37°C in 384-well plates in LB/2x carb liquid media.

The cells were lysed, and DNA was amplified by PCR using Taq DNA polymerase (Amersham Pharmacia Biotech) and Pfu DNA polymerase (Stratagene) with the following parameters: Step 1: 94°C, 3 min; Step 2: 94°C, 15 sec; Step 3: 60°C, 1 min; Step 4: 72°C, 2 min; Step 5: steps 2, 3, and 4 repeated 29 times; Step 6: 72°C, 5 min; Step 7: storage at 4°C. DNA was quantified by PICOGREEN reagent (Molecular Probes) as described above. Samples with low DNA recoveries were reamplified using the same conditions as described above. Samples were diluted with 20% dimethylsulfoxide (1:2, v/v), and sequenced using DYENAMIC energy transfer sequencing primers and the DYENAMIC DIRECT kit (Amersham Pharmacia Biotech) or the ABI PRISM BIGDYE Terminator cycle sequencing ready reaction kit (PE Biosystems).

In like manner, the polynucleotide sequences of SEQ ID NO:38-74 are used to obtain 5' regulatory sequences using the procedure above, along with oligonucleotides designed for such extension, and an appropriate genomic library.

VII. Labeling and Use of Individual Hybridization Probes

Hybridization probes derived from SEQ ID NO:38-74 are employed to screen cDNAs, genomic DNAs, or mRNAs. Although the labeling of oligonucleotides, consisting of about 20 base pairs, is specifically described, essentially the same procedure is used with larger nucleotide fragments. Oligonucleotides are designed using state-of-the-art software such as OLIGO 4.06 software (National Biosciences) and labeled by combining 50 pmol of each oligomer, 250 μ Ci of [γ -³²P] adenosine triphosphate (Amersham Pharmacia Biotech), and T4 polynucleotide kinase (DuPont NEN, Boston MA). The labeled oligonucleotides are substantially purified using a

SEPHADEX G-25 superfine size exclusion dextran bead column (Amersham Pharmacia Biotech). An aliquot containing 10^7 counts per minute of the labeled probe is used in a typical membrane-based hybridization analysis of human genomic DNA digested with one of the following endonucleases: Ase I, Bgl II, Eco RI, Pst I, Xba I, or Pvu II (DuPont NEN).

5 The DNA from each digest is fractionated on a 0.7% agarose gel and transferred to nylon membranes (Nytran Plus, Schleicher & Schuell, Durham NH). Hybridization is carried out for 16 hours at 40°C. To remove nonspecific signals, blots are sequentially washed at room temperature under conditions of up to, for example, 0.1 x saline sodium citrate and 0.5% sodium dodecyl sulfate. Hybridization patterns are visualized using autoradiography or an alternative imaging means and
10 compared.

VIII. Microarrays

 The linkage or synthesis of array elements upon a microarray can be achieved utilizing photolithography, piezoelectric printing (ink-jet printing, See, e.g., Baldeschweiler, supra), mechanical microspotting technologies, and derivatives thereof. The substrate in each of the
15 aforementioned technologies should be uniform and solid with a non-porous surface (Skena (1999), supra). Suggested substrates include silicon, silica, glass slides, glass chips, and silicon wafers. Alternatively, a procedure analogous to a dot or slot blot may also be used to arrange and link elements to the surface of a substrate using thermal, UV, chemical, or mechanical bonding procedures. A typical array may be produced using available methods and machines well known to
20 those of ordinary skill in the art and may contain any appropriate number of elements. (See, e.g., Skena, M. et al. (1995) Science 270:467-470; Shalon, D. et al. (1996) Genome Res. 6:639-645; Marshall, A. and J. Hodgson (1998) Nat. Biotechnol. 16:27-31.)

 Full length cDNAs, Expressed Sequence Tags (ESTs), or fragments or oligomers thereof may comprise the elements of the microarray. Fragments or oligomers suitable for hybridization can be
25 selected using software well known in the art such as LASERGENE software (DNASTAR). The array elements are hybridized with polynucleotides in a biological sample. The polynucleotides in the biological sample are conjugated to a fluorescent label or other molecular tag for ease of detection. After hybridization, nonhybridized nucleotides from the biological sample are removed, and a fluorescence scanner is used to detect hybridization at each array element. Alternatively, laser
30 desorption and mass spectrometry may be used for detection of hybridization. The degree of complementarity and the relative abundance of each polynucleotide which hybridizes to an element on the microarray may be assessed. In one embodiment, microarray preparation and usage is described in detail below.

Tissue or Cell Sample Preparation

35 Total RNA is isolated from tissue samples using the guanidinium thiocyanate method and

poly(A)⁺ RNA is purified using the oligo-(dT) cellulose method. Each poly(A)⁺ RNA sample is reverse transcribed using MMLV reverse-transcriptase, 0.05 pg/μl oligo-(dT) primer (21mer), 1X first strand buffer, 0.03 units/μl RNase inhibitor, 500 μM dATP, 500 μM dGTP, 500 μM dTTP, 40 μM dCTP, 40 μM dCTP-Cy3 (BDS) or dCTP-Cy5 (Amersham Pharmacia Biotech). The reverse transcription reaction is performed in a 25 ml volume containing 200 ng poly(A)⁺ RNA with GEMBRIGHT kits (Incyte). Specific control poly(A)⁺ RNAs are synthesized by in vitro transcription from non-coding yeast genomic DNA. After incubation at 37 °C for 2 hr, each reaction sample (one with Cy3 and another with Cy5 labeling) is treated with 2.5 ml of 0.5M sodium hydroxide and incubated for 20 minutes at 85 °C to stop the reaction and degrade the RNA. Samples are purified using two successive CHROMA SPIN 30 gel filtration spin columns (CLONTECH Laboratories, Inc. (CLONTECH), Palo Alto CA) and after combining, both reaction samples are ethanol precipitated using 1 ml of glycogen (1 mg/ml), 60 ml sodium acetate, and 300 ml of 100% ethanol. The sample is then dried to completion using a SpeedVAC (Savant Instruments Inc., Holbrook NY) and resuspended in 14 μl 5X SSC/0.2% SDS.

15 Microarray Preparation

Sequences of the present invention are used to generate array elements. Each array element is amplified from bacterial cells containing vectors with cloned cDNA inserts. PCR amplification uses primers complementary to the vector sequences flanking the cDNA insert. Array elements are amplified in thirty cycles of PCR from an initial quantity of 1-2 ng to a final quantity greater than 5 μg. Amplified array elements are then purified using SEPHACRYL-400 (Amersham Pharmacia Biotech).

Purified array elements are immobilized on polymer-coated glass slides. Glass microscope slides (Corning) are cleaned by ultrasound in 0.1% SDS and acetone, with extensive distilled water washes between and after treatments. Glass slides are etched in 4% hydrofluoric acid (VWR Scientific Products Corporation (VWR), West Chester PA), washed extensively in distilled water, and coated with 0.05% aminopropyl silane (Sigma) in 95% ethanol. Coated slides are cured in a 110°C oven.

Array elements are applied to the coated glass substrate using a procedure described in US Patent No. 5,807,522, incorporated herein by reference. 1 μl of the array element DNA, at an average concentration of 100 ng/μl, is loaded into the open capillary printing element by a high-speed robotic apparatus. The apparatus then deposits about 5 nl of array element sample per slide.

Microarrays are UV-crosslinked using a STRATALINKER UV-crosslinker (Stratagene). Microarrays are washed at room temperature once in 0.2% SDS and three times in distilled water. Non-specific binding sites are blocked by incubation of microarrays in 0.2% casein in phosphate buffered saline (PBS) (Tropix, Inc., Bedford MA) for 30 minutes at 60 °C followed by washes in

0.2% SDS and distilled water as before.

Hybridization

Hybridization reactions contain 9 μ l of sample mixture consisting of 0.2 μ g each of Cy3 and Cy5 labeled cDNA synthesis products in 5X SSC, 0.2% SDS hybridization buffer. The sample mixture is heated to 65°C for 5 minutes and is aliquoted onto the microarray surface and covered with an 1.8 cm² coverslip. The arrays are transferred to a waterproof chamber having a cavity just slightly larger than a microscope slide. The chamber is kept at 100% humidity internally by the addition of 140 μ l of 5X SSC in a corner of the chamber. The chamber containing the arrays is incubated for about 6.5 hours at 60°C. The arrays are washed for 10 min at 45°C in a first wash buffer (1X SSC, 0.1% SDS), three times for 10 minutes each at 45°C in a second wash buffer (0.1X SSC), and dried.

Detection

Reporter-labeled hybridization complexes are detected with a microscope equipped with an Innova 70 mixed gas 10 W laser (Coherent, Inc., Santa Clara CA) capable of generating spectral lines at 488 nm for excitation of Cy3 and at 632 nm for excitation of Cy5. The excitation laser light is focused on the array using a 20X microscope objective (Nikon, Inc., Melville NY). The slide containing the array is placed on a computer-controlled X-Y stage on the microscope and raster-scanned past the objective. The 1.8 cm x 1.8 cm array used in the present example is scanned with a resolution of 20 micrometers.

In two separate scans, a mixed gas multiline laser excites the two fluorophores sequentially. Emitted light is split, based on wavelength, into two photomultiplier tube detectors (PMT R1477, Hamamatsu Photonics Systems, Bridgewater NJ) corresponding to the two fluorophores. Appropriate filters positioned between the array and the photomultiplier tubes are used to filter the signals. The emission maxima of the fluorophores used are 565 nm for Cy3 and 650 nm for Cy5. Each array is typically scanned twice, one scan per fluorophore using the appropriate filters at the laser source, although the apparatus is capable of recording the spectra from both fluorophores simultaneously.

The sensitivity of the scans is typically calibrated using the signal intensity generated by a cDNA control species added to the sample mixture at a known concentration. A specific location on the array contains a complementary DNA sequence, allowing the intensity of the signal at that location to be correlated with a weight ratio of hybridizing species of 1:100,000. When two samples from different sources (e.g., representing test and control cells), each labeled with a different fluorophore, are hybridized to a single array for the purpose of identifying genes that are differentially expressed, the calibration is done by labeling samples of the calibrating cDNA with the two fluorophores and adding identical amounts of each to the hybridization mixture.

The output of the photomultiplier tube is digitized using a 12-bit RTI-835H analog-to-digital

(A/D) conversion board (Analog Devices, Inc., Norwood MA) installed in an IBM-compatible PC computer. The digitized data are displayed as an image where the signal intensity is mapped using a linear 20-color transformation to a pseudocolor scale ranging from blue (low signal) to red (high signal). The data is also analyzed quantitatively. Where two different fluorophores are excited and measured simultaneously, the data are first corrected for optical crosstalk (due to overlapping emission spectra) between the fluorophores using each fluorophore's emission spectrum.

A grid is superimposed over the fluorescence signal image such that the signal from each spot is centered in each element of the grid. The fluorescence signal within each element is then integrated to obtain a numerical value corresponding to the average intensity of the signal. The software used for signal analysis is the GEMTOOLS gene expression analysis program (Incyte).

IX. Complementary Polynucleotides

Sequences complementary to the MEMAP-encoding sequences, or any parts thereof, are used to detect, decrease, or inhibit expression of naturally occurring MEMAP. Although use of oligonucleotides comprising from about 15 to 30 base pairs is described, essentially the same procedure is used with smaller or with larger sequence fragments. Appropriate oligonucleotides are designed using OLIGO 4.06 software (National Biosciences) and the coding sequence of MEMAP. To inhibit transcription, a complementary oligonucleotide is designed from the most unique 5' sequence and used to prevent promoter binding to the coding sequence. To inhibit translation, a complementary oligonucleotide is designed to prevent ribosomal binding to the MEMAP-encoding transcript.

X. Expression of MEMAP

Expression and purification of MEMAP is achieved using bacterial or virus-based expression systems. For expression of MEMAP in bacteria, cDNA is subcloned into an appropriate vector containing an antibiotic resistance gene and an inducible promoter that directs high levels of cDNA transcription. Examples of such promoters include, but are not limited to, the *trp-lac* (*tac*) hybrid promoter and the T5 or T7 bacteriophage promoter in conjunction with the *lac* operator regulatory element. Recombinant vectors are transformed into suitable bacterial hosts, e.g., BL21(DE3). Antibiotic resistant bacteria express MEMAP upon induction with isopropyl beta-D-thiogalactopyranoside (IPTG). Expression of MEMAP in eukaryotic cells is achieved by infecting insect or mammalian cell lines with recombinant Autographica californica nuclear polyhedrosis virus (AcMNPV), commonly known as baculovirus. The nonessential polyhedrin gene of baculovirus is replaced with cDNA encoding MEMAP by either homologous recombination or bacterial-mediated transposition involving transfer plasmid intermediates. Viral infectivity is maintained and the strong polyhedrin promoter drives high levels of cDNA transcription. Recombinant baculovirus is used to infect Spodoptera frugiperda (Sf9) insect cells in most cases, or human hepatocytes, in some cases.

Infection of the latter requires additional genetic modifications to baculovirus. (See Engelhard, E.K. et al. (1994) Proc. Natl. Acad. Sci. USA 91:3224-3227; Sandig, V. et al. (1996) Hum. Gene Ther. 7:1937-1945.)

In most expression systems, MEMAP is synthesized as a fusion protein with, e.g., glutathione S-transferase (GST) or a peptide epitope tag, such as FLAG or 6-His, permitting rapid, single-step, affinity-based purification of recombinant fusion protein from crude cell lysates. GST, a 26-kilodalton enzyme from Schistosoma japonicum, enables the purification of fusion proteins on immobilized glutathione under conditions that maintain protein activity and antigenicity (Amersham Pharmacia Biotech). Following purification, the GST moiety can be proteolytically cleaved from MEMAP at specifically engineered sites. FLAG, an 8-amino acid peptide, enables immunoaffinity purification using commercially available monoclonal and polyclonal anti-FLAG antibodies (Eastman Kodak). 6-His, a stretch of six consecutive histidine residues, enables purification on metal-chelate resins (QIAGEN). Methods for protein expression and purification are discussed in Ausubel (1995, supra, ch. 10 and 16). Purified MEMAP obtained by these methods can be used directly in the assays shown in Examples XI and XV.

XI. Demonstration of MEMAP Activity

MEMAP activity is demonstrated using a generic immunoblotting strategy or through a MEMAP-specific activity assay as outlined below. As a general approach, cell lines or tissues transformed with a vector containing MEMAP coding sequences can be assayed for MEMAP activity by immunoblotting. Transformed cells are denatured in SDS in the presence of β -mercaptoethanol, nucleic acids are removed by ethanol precipitation, and proteins are purified by acetone precipitation. Pellets are resuspended in 20 mM tris buffer at pH 7.5 and incubated with Protein G-Sepharose pre-coated with an antibody specific for MEMAP. After washing, the Sepharose beads are boiled in electrophoresis sample buffer, and the eluted proteins subjected to SDS-PAGE. Proteins are transferred from the SDS-PAGE gel to a membrane for immunoblotting, and the MEMAP activity is assessed by visualizing and quantifying bands on the blot using antibody specific for MEMAP as the primary antibody and ^{125}I -labeled IgG specific for the primary antibody as the secondary antibody.

A specific assay for MEMAP activity measures the expression of MEMAP on the cell surface. cDNA encoding MEMAP is transfected into a mammalian (non-human) cell line. Cell surface proteins are labeled with biotin as described in de la Fuente, M.A., et al. ((1997) Blood 90:2398-2405). Immunoprecipitations are performed using MEMAP-specific antibodies, and immunoprecipitated samples are analyzed using SDS-PAGE and immunoblotting techniques. The ratio of labeled immunoprecipitant to unlabeled immunoprecipitant is proportional to the amount of MEMAP expressed on the cell surface.

In an alternative specific assay, MEMAP transport activity is assayed by measuring uptake of

labeled substrates into Xenopus laevis oocytes. Oocytes at stages V and VI are injected with MEMAP mRNA (10 ng per oocyte) and incubated for 3 days at 18°C in OR2 medium (82.5mM NaCl, 2.5 mM KCl, 1mM CaCl₂, 1mM MgCl₂, 1mM Na₂HPO₄, 5 mM Hepes, 3.8 mM NaOH , 50µg/ml gentamycin, pH 7.8) to allow expression of MEMAP protein. Oocytes are then transferred to standard uptake medium (100mM NaCl, 2 mM KCl, 1mM CaCl₂, 1mM MgCl₂, 10 mM Hepes/Tris pH 7.5). Uptake of various substrates (e.g., amino acids, sugars, drugs, and neurotransmitters) is initiated by adding a ³H substrate to the oocytes. After incubating for 30 minutes, uptake is terminated by washing the oocytes three times in Na⁺-free medium, measuring the incorporated ³H, and comparing with controls. MEMAP activity is proportional to the level of internalized ³H substrate.

XII. Functional Assays

MEMAP function is assessed by expressing the sequences encoding MEMAP at physiologically elevated levels in mammalian cell culture systems. cDNA is subcloned into a mammalian expression vector containing a strong promoter that drives high levels of cDNA expression. Vectors of choice include pCMV SPORT plasmid (Life Technologies) and pCR3.1 plasmid (Invitrogen), both of which contain the cytomegalovirus promoter. 5-10 µg of recombinant vector are transiently transfected into a human cell line, for example, an endothelial or hematopoietic cell line, using either liposome formulations or electroporation. 1-2 µg of an additional plasmid containing sequences encoding a marker protein are co-transfected. Expression of a marker protein provides a means to distinguish transfected cells from nontransfected cells and is a reliable predictor of cDNA expression from the recombinant vector. Marker proteins of choice include, e.g., Green Fluorescent Protein (GFP; Clontech), CD64, or a CD64-GFP fusion protein. Flow cytometry (FCM), an automated, laser optics-based technique, is used to identify transfected cells expressing GFP or CD64-GFP and to evaluate the apoptotic state of the cells and other cellular properties. FCM detects and quantifies the uptake of fluorescent molecules that diagnose events preceding or coincident with cell death. These events include changes in nuclear DNA content as measured by staining of DNA with propidium iodide; changes in cell size and granularity as measured by forward light scatter and 90 degree side light scatter; down-regulation of DNA synthesis as measured by decrease in bromodeoxyuridine uptake; alterations in expression of cell surface and intracellular proteins as measured by reactivity with specific antibodies; and alterations in plasma membrane composition as measured by the binding of fluorescein-conjugated Annexin V protein to the cell surface. Methods in flow cytometry are discussed in Ormerod, M.G. (1994) Flow Cytometry, Oxford, New York NY.

The influence of MEMAP on gene expression can be assessed using highly purified populations of cells transfected with sequences encoding MEMAP and either CD64 or CD64-GFP. CD64 and CD64-GFP are expressed on the surface of transfected cells and bind to conserved regions

of human immunoglobulin G (IgG). Transfected cells are efficiently separated from nontransfected cells using magnetic beads coated with either human IgG or antibody against CD64 (DYNAL, Lake Success NY). mRNA can be purified from the cells using methods well known by those of skill in the art. Expression of mRNA encoding MEMAP and other genes of interest can be analyzed by northern analysis or microarray techniques.

XIII. Production of MEMAP Specific Antibodies

MEMAP substantially purified using polyacrylamide gel electrophoresis (PAGE; see, e.g., Harrington, M.G. (1990) *Methods Enzymol.* 182:488-495), or other purification techniques, is used to immunize rabbits and to produce antibodies using standard protocols.

Alternatively, the MEMAP amino acid sequence is analyzed using LASERGENE software (DNASTAR) to determine regions of high immunogenicity, and a corresponding oligopeptide is synthesized and used to raise antibodies by means known to those of skill in the art. Methods for selection of appropriate epitopes, such as those near the C-terminus or in hydrophilic regions are well described in the art. (See, e.g., Ausubel, 1995, *supra*, ch. 11.)

Typically, oligopeptides of about 15 residues in length are synthesized using an ABI 431A peptide synthesizer (PE Biosystems) using Fmoc chemistry and coupled to KLH (Sigma-Aldrich, St. Louis MO) by reaction with N-maleimidobenzoyl-N-hydroxysuccinimide ester (MBS) to increase immunogenicity. (See, e.g., Ausubel, 1995, *supra*.) Rabbits are immunized with the oligopeptide-KLH complex in complete Freund's adjuvant. Resulting antisera are tested for antipeptide and anti-MEMAP activity by, for example, binding the peptide or MEMAP to a substrate, blocking with 1% BSA, reacting with rabbit antisera, washing, and reacting with radio-iodinated goat anti-rabbit IgG.

XIV. Purification of Naturally Occurring MEMAP Using Specific Antibodies

Naturally occurring or recombinant MEMAP is substantially purified by immunoaffinity chromatography using antibodies specific for MEMAP. An immunoaffinity column is constructed by covalently coupling anti-MEMAP antibody to an activated chromatographic resin, such as CNBr-activated SEPHAROSE (Amersham Pharmacia Biotech). After the coupling, the resin is blocked and washed according to the manufacturer's instructions.

Media containing MEMAP are passed over the immunoaffinity column, and the column is washed under conditions that allow the preferential absorbance of MEMAP (e.g., high ionic strength buffers in the presence of detergent). The column is eluted under conditions that disrupt antibody/MEMAP binding (e.g., a buffer of pH 2 to pH 3, or a high concentration of a chaotrope, such as urea or thiocyanate ion), and MEMAP is collected.

XV. Identification of Molecules Which Interact with MEMAP

MEMAP, or biologically active fragments thereof, are labeled with ¹²⁵I Bolton-Hunter reagent. (See, e.g., Bolton A.E. and W.M. Hunter (1973) *Biochem. J.* 133:529-539.) Candidate

molecules previously arrayed in the wells of a multi-well plate are incubated with the labeled MEMAP, washed, and any wells with labeled MEMAP complex are assayed. Data obtained using different concentrations of MEMAP are used to calculate values for the number, affinity, and association of MEMAP with the candidate molecules.

5 Alternatively, molecules interacting with MEMAP are analyzed using the yeast two-hybrid system as described in Fields, S. and O. Song (1989, Nature 340:245-246), or using commercially available kits based on the two-hybrid system, such as the MATCHMAKER system (Clontech).

 MEMAP may also be used in the PATHCALLING process (CuraGen Corp., New Haven CT) which employs the yeast two-hybrid system in a high-throughput manner to determine all interactions
10 between the proteins encoded by two large libraries of genes (Nandabalan, K. et al. (2000) U.S. Patent No. 6,057,101).

 Various modifications and variations of the described methods and systems of the invention will be apparent to those skilled in the art without departing from the scope and spirit of the
15 invention. Although the invention has been described in connection with certain embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are obvious to those skilled in molecular biology or related fields are intended to be within the scope of the following claims.

Table 1

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|-----------|--|
| 1 | 38 | 112301 | PITUNOT01 | 003382R1 (HMC1NOT01), 094523R1 (PITUNOT01), 112301H1 (PITUNOT01), 301778X11 (TESTNOT04), 320551X13 (EOSIHET02), 1368852R1 (SCORNON02), 1800784H1 (COLNNOT27), 2117174X17C1 (BRSTTUT02), 2526345F6 (BRAITUT21), 4333609H1 (KIDCTWT01) |
| 2 | 39 | 997947 | KIDNTUT01 | 997947H1 (KIDNTUT01), 997947T6 (KIDNTUT01), 1417936X306D1 (KIDNNOT09), 1672062X307V1 (BLADNOT05), 3738956T6 (MENTNOT01), SCCA01437V1, SCCA05013V1, SCCA01691V1, SCCA02873V1 |
| 3 | 40 | 1521513 | BLADTUT04 | 1222062H1 (NEUTGMT01), 1521513H1 (BLADTUT04), 1521513T1 (BLADTUT04), 3558522F6 (LUNGNOT31), 3558522T6 (LUNGNOT31) |
| 4 | 41 | 1863994 | PROSNOT19 | 265171R6 (HNT2AGT01), 1863994H1 (PROSNOT19), 3750444F6 (UTRSNOT18), 4177677F6 (BRAINOT22), 4697638F6 (BRALNOT01), 4774040F6 (BRAQNOT01), SCEA02960V1 |
| 5 | 42 | 2071941 | ISLTNOT01 | 286350R1 (EOSIHET02), 491305R1 (HNT2AGT01), 724168R1 (SYNCOAT01), 1466668F1 (PANCTUT02), 2071941H1 (ISLTNOT01), 2071941X11C1 (ISLTNOT01), 3579445H1 (293TF3T01) |
| 6 | 43 | 2172512 | ENDCNOT03 | 2172512H1 (ENDCNOT03), 2544419F6 (UTRSNOT11), 2798626H1 (NPOLNOT01), 3203359H1 (PENCNOT02), g1241299 |
| 7 | 44 | 2483172 | SMCANOT01 | 217987F1 (STOMNOT01), 1289703F6 (BRAINOT11), 1289703T6 (BRAINOT11), 2211377F6 (SINTFET03), 2483172H1 (SMCANOT01), 2493236H1 (ADRETUT05), 3274006F6 (PROSBPT06) |

Table 1

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|-----------|---|
| 8 | 45 | 2656128 | THYMN04 | 2654722T6 (THYMN04), 2656128H1 (THYMN04), 2837168F6 (TLYMN03) |
| 9 | 46 | 5855841 | FIBAUNT02 | 894553T1 (BRSTNOT05), 1296289F1 (PGANN03), 1466541T1 (PANCUT02), 2046927F6 (THP1T7T01), 2058873R6 (OVARNOT03), 3800875F6 (SPLNNOT12), 5855841H1 (FIBAUNT02) |
| 10 | 47 | 603462 | BRSTTUT01 | 603462H1 (BRSTTUT01), 1487733H1 (UCMCL5T01), 1750451F6 (STOMTUT02), 5182853T6 (LUNGWT03) |
| 11 | 48 | 747681 | BRAITUT01 | 747681H1 (BRAITUT01), 752009R1 (BRAITUT01), 1267874F1 (BRAINOT09), 1833308R6 (BRAINON01), 2673538X19F1 (KIDNNOT19), SBCA07003F3, SCDA07521V1, SCDA04982V1, SCDA07275V1 |
| 12 | 49 | 919469 | RATRN02 | 153337R6 (THP1PLB02), 1525415F6 (UCMCL5T01), 1527804F1 (UCMCL5T01), 1985565R6 (LUNGAST01), 2397811T6 (THP1AZT01), SARBO1416F1, SARA03198F1 |
| 13 | 50 | 977658 | BRSTNOT02 | 977658H1 (BRSTNOT02), 1873689F6 (LEUKNOT02), 2155095F6 (BRAINOT09), 2186432F6 (PROSN026), 2204117F6 (SPLNFET02), 2206291F6 (SPLNFET02), 3255048R6 (OVARUN01), 3501520H1 (ADREN011), 3743427H1 (THYMN08) |
| 14 | 51 | 1004703 | BRSTNOT03 | 742178H1 (PANCNOT04), 1444583F6 (THYRN03), 2068902X15C1 (ISLTNOT01), 2616367F6 (GBLANOT01), SBVA02190V1 |
| 15 | 52 | 1334051 | COLNNOT13 | 3222815T6 (COLNNON03), SXBC00794V1, SXBC00639V1 |
| 16 | 53 | 1336728 | COLNNOT13 | 630458R6 (KIDNNOT05), 1336728H1 (COLNNOT13), SXBC00758V1, SXBC01825V1, SXBC01531V1, SXBC01624V1, SXBC00128V1 |

Table 1

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|-----------|--|
| 17 | 54 | 1452856 | PENITUT01 | 873008R1 (LUNGAST01), 1452856H1 (PENITUT01), 2433573H1 (BRAVUNT02), 2444932F6 (THPINOT03), 2858295F6 (SININOT03) |
| 18 | 55 | 1562471 | SPLNNOT04 | 286237F1 (EOSIHET02), 1562471H1 (SPLNNOT04), 1880730F6 (LEUKNOT03), 3420608F6 (UCMCNOT04), SBWA00968V1, SXBC01387V1, SBWA02301V1 |
| 19 | 56 | 1618158 | BRAITUT12 | 967563R1 (BRSTNOT05), 1618158H1 (BRAITUT12), 1785271F6 (BRAINOT10), 2074680F6 (ISLTNOT01), 2822196H1 (ADRETUT06) |
| 20 | 57 | 1656935 | URETTUT01 | 1656935F6 (URETTUT01), 1656935H1 (URETTUT01), 2827605F6 (TLYMNOT03), 5272146H1 (OVARINOT02), g1482116 |
| 21 | 58 | 1859305 | PROSNOT18 | 079372F1 (SYNORAB01), 639845R1 (BRSTNOT03), 1859305H1 (PROSNOT18), 3328091F6 (HEAONOT04), 3354812F6 (PROSNOT28), 5510642H1 (BRADDIR01) |
| 22 | 59 | 1949083 | PITUNOT01 | 1287161H1 (BRAINOT11), 1949083H1 (PITUNOT01), 1949083R6 (PITUNOT01), 1949083T6 (PITUNOT01), 3814131F6 (TONSNOT03) |
| 23 | 60 | 1996357 | BRSTTUT03 | 260527R6 (HNT2RAT01), 260527T6 (HNT2RAT01), 1313441F1 (BLADTUT02), 1442781R1 (THYRNOT03), 1996357H1 (BRSTTUT03), 1996357T6 (BRSTTUT03), 4262451H1 (BSCNDIT02), SAZA00147F1 |
| 24 | 61 | 2061330 | OVARNOT03 | 2061330H1 (OVARNOT03), 2724233T6 (LUNGUTUT10), 5104031T6 (PROSTUS20) |
| 25 | 62 | 2346947 | TESTTUT02 | 2346947F6 (TESTTUT02), 2346947H1 (TESTTUT02), 4051345F6 (SINTNOT18) |

Table 1

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|-----------|--|
| 26 | 63 | 2795577 | NPOLNOT01 | 867213R6 (BRAITUT03), 2381770H1 (ISLTNOT01), 2795577CT1 (NPOLNOT01), 2795577H1 (NPOLNOT01) |
| 27 | 64 | 3255825 | OVARTUN01 | 3255825CT1 (OVARTUN01), 3255825H1 (OVARTUN01) |
| 28 | 65 | 3393430 | LUNGNOT28 | 2187169H1 (PROSNOT26), 3393256H1 (LUNGNOT28), 3393430H1 (LUNGNOT28), 3395774H1 (LUNGNOT28), 4689688H1 (LIVRTUT12), 4895996H1 (LIVRTUT12), 4896461F6 (LIVRTUT12), 4984527F6 (LIVRTUT10), 4992946H1 (LIVRTUT11) |
| 29 | 66 | 3490990 | EPIGNOT01 | 1235428F1 (LUNGFET03), 1662973T6 (BRSTNOT09), 2362021H1 (LUNGFET05), 2362021R6 (LUNGFET05), 3490990H1 (EPIGNOT01) |
| 30 | 67 | 3635154 | LIVRNOT03 | 027592H1 (SPLNFET01), 3635154H1 (LIVRNOT03), g1012932 |
| 31 | 68 | 4374347 | CONFNOT03 | 860875X11 (BRAITUT03), 898143R6 (BRSTNOT05), 4374347H1 (CONFNOT03) |
| 32 | 69 | 4596747 | COLSTUT01 | 137213R1 (SYNORAB01), 545568R6 (OVARNOT02), 1235402F1 (LUNGFET03), 1268010F1 (BRAINOT09), 1271078F1 (TESTTUT02), 1301951F6 (BRSTNOT07), 1994442R6 (BRSTTUT03), 2343102H1 (TESTTUT02), 3274538F6 (PROSBPT06), 4596747H1 (COLSTUT01) |
| 33 | 70 | 5052680 | BRSTNOT33 | 1973688H1 (UCMCL5T01), 3926410F6 (KIDNNOT19), 4501839F6 (BRAVXT02), 5052680F6 (BRSTNOT33), 5052680H1 (BRSTNOT33), 5186780F6 (LUNGTM04) |
| 34 | 71 | 5373575 | BRAINOT22 | 262776T6 (HNT2AGT01), 1234057F1 (LUNGFET03), 1741526R6 (HIPONON01), 1871204F6 (SKINBIT01), 2192479F6 (THYRTUT03), 2556849H1 (THYMNOT03), 2722451T6 (LUNGTUT10), 4114985H1 (UTRSTUT07), 5373575H1 (BRAINOT22) |

Table 1

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|-----------|---|
| 35 | 72 | 5524468 | LIVRDIR01 | 4024068F6 (BRAXNOT02), 5524468H1 (LIVRDIR01), SXBC01952V1 |
| 36 | 73 | 5944279 | COLADIT05 | 1662182H1 (BRSTNOT09), 1698677F6 (BLADTUT05), 1916639R6 (PROSNOT06), 1916639T6 (PROSNOT06), 2298565R6 (BRSTNOT05), 2298565T6 (BRSTNOT05), 2583019F6 (KIDNTUT13), 2870903F6 (THYRNOT10), 3970715H1 (PROSTUT10), 3971695H1 (PROSTUT10), 5944279H1 (COLADIT05) |
| 37 | 74 | 6114480 | SINITWT04 | 1579843F6 (DUODNOT01), 1579843T6 (DUODNOT01), 4181024T6 (SINITUT03), 6114480H1 (SINITWT04), SXBC00007V1, SXBC00504V1, SCSA05104V1 |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|--|---------------------------------------|--|---|--|
| 1 | 351 | S31 T116 S169 T229 T2 S209 T306 | N128 | Signal peptide: M1-A33 | Paraneoplastic neural antigen MA1 [Homo sapiens] g4104634 | BLAST-GenBank MOTIFS SPSCAN |
| 2 | 458 | T198 S27 S37 T87 S251 S257 S325 S373 S405 S422 T454 T210 S228 S401 Y93 | N75 N159 N279 N445 | Signal peptide: M1-T24 Glycoprotein signature: C199-L448 | Pancortin-3 [Mus musculus] g3218528 | BLAST-GenBank MOTIFS SPSCAN HMMER BLAST-PRODOM |
| 3 | 219 | T51 S120 S163 T175 T181 S3 T12 T45 S75 S104 S128 | N2 N62 N107 | Signal peptide: M1-C42 Transmembrane domain: L32-F49 C-type lectin domain: C80-E206 | Murine macrophage C- type lectin [Mus musculus] g5821286 | BLAST-GenBank MOTIFS SPSCAN HMMER HMMER-PFAM BLIMPS-BLOCKS PROFILES-SCAN BLAST-DOMO |
| 4 | 276 | S213 S91 S113 S35 S70 S76 S147 T163 S206 | | Signal peptide: M1-G31 Transmembrane domain: I184-F201 Cell attachment sequence: R149-D151 | | BLAST-GenBank MOTIFS HMMER |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|--|---------------------------------------|--|---|---|
| 5 | 375 | S18 S205 T286 S3 S120 S197 T260 Y85 | | Transmembrane domains: W139-R158; F173-H191 P232-Q254 Transmembrane protein signature: I95-C369 | Transmembrane protein [S. pombe] g1065898 | BLAST-GenBank MOTIFS HMMER BLAST-DOMO BLAST-PRODOM |
| 6 | 249 | T7 T135 T170 S204 Y154 | N18 N92 N147 | | Phospholipid scramblase [Homo sapiens] g4092081 | BLAST-GenBank MOTIFS |
| 7 | 353 | T162 T4 S97 T115 S165 S194 T225 S242 S17 S47 S205 | N299 | Signal peptide: M1-A33 | Paraneoplastic neuronal antigen MA1 [Homo sapiens] g4104634 | BLAST-GenBank MOTIFS SPSCAN |
| 8 | 194 | T12 S115 S29 S99 S187 | N95 N147 | Signal peptide: M1-C50 Transmembrane domain: L38-L56 C-type lectin domain: C75-E194 | Lectin-like NK cell receptor LLT1 [Homo sapiens] g6651065 | BLAST-GenBank MOTIFS SPSCAN HMMER HMMER-PFAM BLIMPS-BLOCKS BLAST-DOMO |
| 9 | 322 | S304 S48 S146 S72 T133 S255 S280 | N20 N60 N70 | Signal peptide: M1-A50 | | BLAST-GenBank MOTIFS SPSCAN |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|---|---|---|--|---|
| 10 | 335 | S125 S140 S183 S222 T252 | | Transmembrane domains: G71-L94; A255-I283 Gufa transmembrane protein domain: L12-H101; G180-G335 Glycosaminoglycan attachment site: S310-G313 | Gufa protein [Thermotoga maritima] g4982315 | BLAST-GenBank MOTIFS HMMER BLAST-PRODOM BLAST-DOMO |
| 11 | 620 | S49 S108 T146 S300 T348 T349 S607 S4 S128 S183 S234 T420 S460 S467 S543 Y597 | N144 N202 N264 N274 N293 N341 N492 N505 N526 N542 | Transmembrane domain: M563-W582 Immunoglobulin domain: G439-A499 Leucine-rich repeat signature: L337-L350 Glycoprotein hormone receptor domain: T40-L198 | Slit2 [Rattus norvegicus] g4585574 | BLAST-GenBank MOTIFS HMMER HMMER-PFAM BLIMPS-PRINTS BLAST-DOMO |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|---|---------------------------------------|--|--|--|
| 12 | 491 | T231 T232 S253 T482 S185 S276 | N56 N220 N229 | Transmembrane domains: I115-I142; I184-V201 F422-F441 Transmembrane protein domain: L8-Y215; I396-F471 | Selectively expressed in embryonic epithelia protein-1 [Mus musculus] g6715148 PB39 [Homo sapiens] g3462515 | BLAST-GenBank MOTIFS HMMER BLAST-PRODOM |
| 13 | 580 | S557 S10 T34 S51 T92 T210 S343 T12 S217 T222 S268 S296 T417 T523 S550 | N159 N179 N220 N230 | Transmembrane domains: F297-F313; I356-I373 L496-I514 Lipases serine active site: L104-A113 | | MOTIFS HMMER |
| 14 | 455 | T53 T182 S239 S69 S135 S202 T280 S355 S372 Y38 | N67 N180 N243 | Transmembrane domains: V81-V99; I343-I361 S375-V392; W425-Y442 Glycosaminoglycan attachment site: S162-G165 | putative G- protein coupled receptor [Homo sapiens] g6649579 | BLAST-GenBank MOTIFS HMMER |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|---|--|---|---|--|
| 15 | 277 | S265 T66 T225 S268 S273 S30 S49 S61 S152 S193 Y242 | N29 N38 N47 N48 N92 N160 N210 | Transmembrane domain: K9-F27 Brush border protein domain: Y8-R277 RGD cell attachment sequence: R113-D115 | AdRab-A brush border membrane protein [Oryctolagus cuniculus] g1762 | BLAST-GenBank MOTIFS HMMER BLAST-PRODOM |
| 16 | 647 | S490 T50 S67 S105 T110 S121 T220 S249 S264 S272 S322 T389 S469 T501 S639 S132 T155 S242 S324 T381 T400 S522 S554 | N261 | Signal peptide: M1-A22 Transmembrane domains: L328-L347; M406-L424 L559-A578; W618-L638 Gufa transmembrane protein domain: E485-L640 Glycosaminoglycan attachment site: S34-G37 | LIV-1 protein [Homo sapiens] g1256001 | BLAST-GenBank MOTIFS SPSCAN HMMER BLAST-PRODOM |
| 17 | 406 | S29 S215 S236 T69 | N23 | Transmembrane domains: Q76-V95; W286-S313 M367-I384 | | MOTIFS HMMER |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|---|---------------------------------------|---|---|--|
| 18 | 290 | T221 S44 S69 S71 S81 T94 T101 T113 T131 S216 Y284 | N88 | Signal peptide: M1-A19 Transmembrane domains: P160-M181 Immunoglobulin domain: R33-I110 Transmembrane glycoprotein domain: I22-D116 | NK inhibitory receptor [Homo sapiens] g6707799 CMRF-35-H9 leukocyte antigen [Homo sapiens] g4103066 | BLAST-GenBank MOTIFS SPSCAN HMMER HMMER-PFAM BLAST-PRODOM BLAST-DOMO |
| 19 | 390 | S7 T68 S153 T23 T166 T281 Y20 Y37 | N5 N88 N330 N367 | Immunoglobulins and MHC proteins signature: T90-P112; F242-V259 Glycoprotein antigen signature: L61-V72; V92-I113 | | MOTIFS BLIMPS-BLOCKS BLIMPS-PRODOR |
| 20 | 427 | S13 S41 S65 S66 S99 T150 S323 S324 S101 S275 S353 S367 T399 Y71 | N106 N148 N171 N233 N312 | Mucin glycoprotein precursor domain: V136-P142 | Gastric mucin [Sus scrofa] g915208 | BLAST-GenBank MOTIFS BLIMPS-PRODOR |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|---|---------------------------------------|---|--|--|
| 21 | 459 | T4 S60 S66 S116 T176 S16 T235 | N14 N158 N323 | Transmembrane domains: F202-V219; I246-L268 W343-L367; P417-P440 | six transmembrane epithelial antigen of prostate [Homo sapiens] g6572948 | BLAST-GenBank MOTIFS HMMER |
| 22 | 229 | S13 S118 T155 Y24 | | Transmembrane domains: I93-V111; V132-L150 F164-V182 Transmembrane protein domain: S156-V182 | | MOTIFS HMMER BLIMPS-PRODOM |
| 23 | 311 | S85 S234 S236 S269 S80 S119 S186 T294 | N22 | Transmembrane domains: W58-I76; P152-K177 A216-Y232 | | MOTIFS HMMER |
| 24 | 92 | S47 T54 T12 S70 | N62 | | HERV-E envelope glycoprotein [Homo sapiens] g2587024 | BLAST-GenBank MOTIFS |
| 25 | 258 | S34 T33 S148 S243 | | Transmembrane domains: I39-I57; F86-L106 V122-I140; L190-S210 | | MOTIFS HMMER |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|---------------------------------------|---------------------------------------|---|---|--|
| 26 | 226 | S56 S128 T196 T167 Y194 | N54 N187 N198 | Signal peptide: M1-P50 Transmembrane domains: T23-L43; M72-A89 I101-I124; I158-N178 Transmembrane 4 family signature: A70-I120 Lysosomal-associated transmembrane protein domain: C15-Y223 | MTP (mouse transporter protein) [Mus musculus] g1276631 | BLAST-GenBank MOTIFS SPSCAN HMMER PROFLESCAN BLAST-PRODOM |
| 27 | 136 | S3 S132 | | Signal peptide: M1-R53 Transmembrane domains: I10-L28; T26-I50 F70-L89 Transmembrane protein domain: D31-V104 | | MOTIFS SPSCAN HMMER BLAST-PRODOM |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 28 | 458 | T408 T98 S126 S170 T334 | N96 N151 N293 N332 | Signal peptide: M1-A20 Transmembrane domain: L10-N30 Membrane glycoprotein signature: L9-V101; L64-Q457 Olfactory ligand binding domain: T67-S452 | Potential ligand (odorant) binding protein [Rattus] g57732 | BLAST-GenBank MOTIFS SPSCAN HMMER BLAST-PRODOM BLAST-DOMO |
| 29 | 368 | S24 T166 T302 S12 S134 Y307 | N17 | | Fuzzy (TM protein involved in tissue polarity) [Drosophila melanogaster] g2564657 | BLAST-GenBank MOTIFS |
| 30 | 91 | T44 S84 | | Signal peptide: M1-A19 Transmembrane domain: P58-S82 Glycophorin A proteins signature: T22-S32; I63-G91 Glycophorin domain: M1-R86 | Preglycophorin B [Homo sapiens] g4803699 | BLAST-GenBank MOTIFS SPSCAN HMMER BLIMPS-BLOCKS PROFILESKAN BLAST-PRODOM BLAST-DOMO |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|--|---------------------------------------|---|--|--|
| 31 | 295 | S96 T113 S129 T155 T125 T157 T187 S222 T231 T263 Y212 | N111 N169 N223 | Signal peptide: M1-G48 Transmembrane domain: L241-L259 Immunoglobulin domain: K159-V216 Carcinoembryonic antigen domain: I38-P147 Glycoprotein antigen domain: M1-V140; Y141-Y234 G239-S295 | Biliary glycoprotein [Mus musculus] g312590 | BLAST-GenBank MOTIFS SPSCAN HMMER HMMER-PFAM BLAST-PRODOM BLAST-DOMO |
| 32 | 724 | T39 S47 T171 S205 T224 S225 T241 S285 S301 T323 S352 T353 S439 S509 S517 S537 T659 T707 S8 S18 S49 S72 T85 T159 S173 S271 S367 S560 S588 Y499 | N279 N348 | Transmembrane domain: I611-F630 Membrane protein domain: T4-L209 | | MOTIFS HMMER BLAST-DOMO |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|--|---------------------------------------|--|---|--|
| 33 | 331 | S117 S147 S149 T320 S138 S174 T274 T319 S328 Y198 | N222 | Signal peptide: M1-S16 Transmembrane domains: A67-N87; I118-C134 W240-V269; L294-Y310 Transmembrane protein domain: A6-T311 | Putative Golgi UDP-GlcNAc transporter [S. pombe] g3738167 | BLAST-GenBank MOTIFS SPSCAN HMMER BLAST-PRODOM |
| 34 | 398 | T42 T158 S271 S28 S285 T334 S375 | | Transmembrane domain: I59-L79 Band 7 family domain: F64-A231, A78-V90; R116-L154 Stomatin signature: T84-L106; L131-P152 T166-L183; I186-G209 L54-Q227 | Stomatin-like protein UNC24 [Homo sapiens] g5326747 | BLAST-GenBank MOTIFS HMMER HMMER-PFAM BLIMPS-BLOCKS BLIMPS-PRINTS BLAST-PRODOM BLAST-DOMO |
| 35 | 220 | S199 T120 S192 | N107 | Signal peptide: M1-G19 Leucine rich repeats: A62-F85; Q86-S109 G110-G133; A134-R157 A158-S181; H184-P207 | Similar to Leucine-rich transmembrane proteins [Homo sapiens] g2781386 | BLAST-GenBank MOTIFS SPSCAN HMMER HMMER-PFAM BLIMPS-PRINTS |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosyla- tion Sites | Signature Sequences, Motifs, and Domains | Homologous Sequences | Analytical Methods and Databases |
|---------------------------|---------------------------|--|---------------------------------------|---|---|---|
| 36 | 706 | T564 T74 T113 S291 S452 S632 S14 T42 S66 T115 T142 S286 T551 T575 S701 | N101 | Transmembrane domains: F158-M178; L344-V368 L425-L442; M478-F498 A581-I604; L641-V665 Glycosaminoglycan attachment site: S223-G226 | LAK-4p [Homo sapiens] g7209574 | BLAST-GenBank MOTIFS HMMER |
| 37 | 466 | T326 S10 T46 T105 S187 S98 T164 T310 S321 Y388 | N368 | Signal peptide: M1-G23 Transmembrane domain: A236-I255 SPRY domain: A338-S464; E123-S136 E322-W343; V407-F420 Butyrophilin domain: W19-C114 | Butyrophilin like receptor [Homo sapiens] g4587209 | BLAST-GenBank MOTIFS SPSCAN HMMER HMMER-PFAM BLIMPS-PFAM BLAST-PRODOM BLAST-DOMO |

Table 3

| Nucleotide SEQ ID NO: | Selected Fragments | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|-----------------------|--|---|-------------|
| 38 | 844-888 | Nervous (0.377) Reproductive (0.180) Cardiovascular (0.115) Gastrointestinal (0.115) | Cancer (0.410) Inflammation/Trauma (0.296) Cell Proliferation (0.131) | PBLUESCRIPT |
| 39 | 579-623 | Developmental (0.400) Musculoskeletal (0.200) Nervous (0.200) Urologic (0.200) | Cancer (0.400) Cell Proliferation (0.400) | PSPORT1 |
| 40 | 336-380 | Cardiovascular (0.267) Hematopoietic/Immune (0.200) Endocrine (0.133) Reproductive (0.133) | Cancer (0.400) Inflammation/Trauma (0.400) Cell Proliferation (0.133) | pINCY |
| 41 | 596-640 | Nervous (0.588) Gastrointestinal (0.118) Reproductive (0.118) | Inflammation/Trauma (0.470) Cancer (0.235) Cell Proliferation (0.176) | pINCY |
| 42 | 1281-1325 | Reproductive (0.237) Hematopoietic/Immune (0.145) Nervous (0.145) | Cancer (0.441) Inflammation/Trauma (0.323) Cell Proliferation (0.178) | pINCY |
| 43 | 227-271 | Reproductive (0.444) Dermatologic (0.222) Endocrine (0.111) Gastrointestinal (0.111) Nervous (0.111) | Cancer (0.333) Cell Proliferation (0.222) Inflammation/Trauma (0.222) | pINCY |

Table 3

| Nucleotide SEQ ID NO: | Selected Fragments | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|-----------------------|--|---|---------|
| 44 | 1368-1412 | Nervous (0.339) Reproductive (0.278) Gastrointestinal (0.104) | Cancer (0.478) Inflammation/Trauma (0.278) Cell Proliferation (0.165) | pINCY |
| 45 | 543-587 | Hematopoietic/Immune (0.500) Gastrointestinal (0.188) | Inflammation/Trauma (0.500) Cancer (0.250) Cell Proliferation (0.188) | pINCY |
| 46 | 280-324 | Reproductive (0.267) Nervous (0.233) Gastrointestinal (0.112) | Cancer (0.483) Inflammation/Trauma (0.345) Cell Proliferation (0.155) | pINCY |
| 47 | 380-424 875-919 | Reproductive (0.412) Gastrointestinal (0.176) Cardiovascular (0.118) | Cancer (0.647) Inflammation/Trauma (0.178) | PSPORT1 |
| 48 | 272-316 1514-1558 | Nervous (0.645) Developmental (0.129) | Cancer (0.355) Cell Proliferation (0.258) Neurological (0.194) | PSPORT1 |
| 49 | 282-326 768-812 | Hematopoietic/Immune (0.238) Gastrointestinal (0.155) Reproductive (0.143) | Cancer (0.381) Inflammation/Trauma (0.381) Cell Proliferation (0.202) | PSPORT1 |
| 50 | 597-641 1074-1118 | Reproductive (0.214) Nervous (0.196) Hematopoietic/Immune (0.143) | Cancer (0.464) Inflammation/Trauma (0.304) Cell Proliferation (0.196) | PSPORT1 |
| 51 | 973-1017 | Reproductive (0.266) Nervous (0.234) Hematopoietic/Immune (0.125) | Cancer (0.516) Inflammation/Trauma (0.359) Cell Proliferation (0.109) | PSPORT1 |

Table 3

| Nucleotide SEQ ID NO: | Selected Fragments | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|---|---|---|--------|
| 52 | 299-343 | Gastrointestinal (1.000) | Cancer (0.500) Inflammation/Trauma (0.500) | pINCY |
| 53 | 380-424 1199-1243 | Gastrointestinal (0.289) Reproductive (0.244) Cardiovascular (0.111) Hematopoietic/Immune (0.111) | Cancer (0.578) Inflammation/Trauma (0.311) Cell Proliferation (0.178) | pINCY |
| 54 | 1135-1179 | Nervous (0.195) Reproductive (0.186) Gastrointestinal (0.144) | Cancer (0.449) Inflammation/Trauma (0.305) Cell Proliferation (0.144) | pINCY |
| 55 | 325-369 820-864 | Hematopoietic/Immune (0.750) | Inflammation/Trauma (0.625) Cancer (0.125) | pINCY |
| 56 | 487-531 1090-1134 | Nervous (0.583) | Cancer (0.458) Inflammation/Trauma (0.250) | pINCY |
| 57 | 569-613 1360-1405 | Reproductive (0.429) Hematopoietic/Immune (0.286) Musculoskeletal (0.143) Urologic (0.143) | Cancer (0.571) Inflammation/Trauma (0.286) Cell Proliferation (0.143) | pINCY |
| 58 | 272-472 551-595 812-1012 1523-1567 | Reproductive (0.350) Nervous (0.150) Cardiovascular (0.100) Gastrointestinal (0.100) Hematopoietic/Immune (0.100) Urologic (0.100) | Cancer (0.500) Inflammation/Trauma (0.500) | pINCY |

Table 3

| Nucleotide SEQ ID NO: | Selected Fragments | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|--|--|---|-------------|
| 59 | 217-261 | Nervous (0.286) Developmental (0.143) Gastrointestinal (0.143) Hematopoietic/Immune (0.143) Reproductive (0.143) | Inflammation/Trauma (0.428) Cancer (0.357) Cell Proliferation (0.143) | PBLUESCRIPT |
| 60 | 444-488 | Nervous (0.207) Reproductive (0.207) Gastrointestinal (0.130) Hematopoietic/Immune (0.130) | Cancer (0.467) Inflammation/Trauma (0.359) Cell Proliferation (0.163) | PSPORT1 |
| 61 | 643-687 | Reproductive (0.464) Endocrine (0.143) Cardiovascular (0.107) Gastrointestinal (0.107) | Cancer (0.500) Inflammation/Trauma (0.321) | PSPORT1 |
| 62 | 146-344 390-434 506-704 786-830 | Gastrointestinal (0.500) Hematopoietic/Immune (0.250) Reproductive (0.250) | Cancer (0.750) Inflammation/Trauma (0.250) | pINCY |
| 63 | 163-207 | Reproductive (0.315) Gastrointestinal (0.161) Cardiovascular (0.147) | Cancer (0.594) Cell Proliferation (0.231) Inflammation/Trauma (0.210) | pINCY |
| 64 | 201-506 525-569 606-912 975-1280 1362-1406 | Gastrointestinal (0.455) Cardiovascular (0.273) Reproductive (0.189) | Cancer (0.455) Inflammation/Trauma (0.367) Cell Proliferation (0.189) | PSPORT1 |

Table 3

| Nucleotide SEQ ID NO: | Selected Fragments | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|---|---|---|--------|
| 65 | 703-747 | Gastrointestinal (0.667) Cardiovascular (0.167) Reproductive (0.167) | Cancer (1.000) | pINCY |
| 66 | 271-315 319-363 | Nervous (0.314) Reproductive (0.314) Developmental (0.114) Urologic (0.114) | Cancer (0.429) Cell Proliferation (0.171) Inflammation/Trauma (0.143) | pINCY |
| 67 | 319-363 | Developmental (0.364) Hematopoietic/Immune (0.364) Gastrointestinal (0.182) | Cell Proliferation (0.727) Cancer (0.273) Inflammation/Trauma (0.182) | pINCY |
| 68 | 812-856 | Reproductive (0.444) Nervous (0.222) Endocrine (0.111) Hematopoietic/Immune (0.111) Musculoskeletal (0.111) | Cancer (0.556) Inflammation/Trauma (0.333) | pINCY |
| 69 | 596-640 1577-1621 | Reproductive (0.255) Nervous (0.184) Developmental (0.122) Gastrointestinal (0.122) | Cancer (0.429) Inflammation/Trauma (0.337) Cell Proliferation (0.255) | pINCY |
| 70 | 379-675 703-747 766-1062 1081-1347 | Nervous (0.467) Hematopoietic/Immune (0.200) Reproductive (0.133) Urologic (0.133) | Cancer (0.467) Cell Proliferation (0.267) Inflammation/Trauma (0.267) | pINCY |

Table 3

| Nucleotide SEQ ID NO: | Selected Fragments | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|-------------------------------|---|---|--------|
| 71 | 18-62 | Nervous (0.265) Reproductive (0.206) Musculoskeletal (0.147) | Cancer (0.500) Inflammation/Trauma (0.264) Cell Proliferation (0.147) | pINCY |
| 72 | 290-488 507-704 759-803 | Gastrointestinal (0.333) Hematopoietic/Immune (0.333) Nervous (0.333) | Inflammation/Trauma (0.667) Cancer (0.333) | pINCY |
| 73 | 649-693 1711-1755 | Reproductive (0.392) Gastrointestinal (0.294) Cardiovascular (0.118) | Cancer (0.686) Inflammation/Trauma (0.294) | pINCY |
| 74 | 704-748 | Gastrointestinal (0.923) | Cancer (0.462) Inflammation/Trauma (0.385) | pINCY |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|---|
| 38 | PITUNOT01 | This library was constructed using RNA obtained from Clontech (CLON 6584-2, lot 35278). The RNA was isolated from pituitary glands removed from a pool of 18 male and female Caucasian donors, 16 to 70 years old, who died from trauma. |
| 39 | KIDNTUT01 | This library was constructed using RNA isolated from kidney tumor tissue removed from an 8-month-old female during nephroureterectomy. Pathology indicated Wilms' tumor (nephroblastoma), which involved 90 percent of the renal parenchyma. Prior to surgery, the patient was receiving heparin anticoagulant therapy. |
| 40 | BLADTUT04 | This library was constructed using RNA isolated from bladder tumor tissue removed from a 60-year-old Caucasian male during a radical cystectomy, prostatectomy, and vasectomy. Pathology indicated grade 3 transitional cell carcinoma in the left bladder wall. Carcinoma in-situ was identified in the dome and trigone. Patient history included tobacco use. Family history included type I diabetes, malignant neoplasm of the stomach, atherosclerotic coronary artery disease, and acute myocardial infarction. |
| 41 | PROSNOT19 | This library was constructed using RNA isolated from diseased prostate tissue removed from a 59-year-old Caucasian male during a radical prostatectomy with regional lymph node excision. Pathology indicated adenofibromatous hyperplasia. Pathology for the associated tumor tissue indicated an adenocarcinoma (Gleason grade 3+3). The patient presented with elevated prostate-specific antigen (PSA). Patient history included colon diverticuli, asbestosis, and thrombophlebitis. Family history included benign hypertension, multiple myeloma, hyperlipidemia and rheumatoid arthritis. |
| 42 | ISLTNOT01 | This library was constructed using RNA isolated from a pooled collection of pancreatic islet cells. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 43 | ENDCNOT03 | This library was constructed using RNA isolated from dermal microvascular endothelial cells removed from a neonatal Caucasian male. |
| 44 | SMCANOT01 | This library was constructed using RNA isolated from an aortic smooth muscle cell line derived from the explanted heart of a male obtained during a heart transplant. |
| 45 | THYMNOT04 | This library was constructed using RNA isolated from thymus tissue removed from a 3-year-old Caucasian male, who died from anoxia. |
| 46 | FIBAUNT02 | This library was constructed using RNA isolated from untreated aortic adventitial fibroblasts removed from a 65-year-old Caucasian female. |
| 47 | BRSTTUT01 | This library was constructed using RNA isolated from breast tumor tissue removed from a 55-year-old Caucasian female during a unilateral extended simple mastectomy. Pathology indicated invasive grade 4 mammary adenocarcinoma. Patient history included atrial tachycardia and a benign breast neoplasm. Family history included cardiovascular and cerebrovascular disease and depressive disorder. |
| 48 | BRAITUT01 | This library was constructed using RNA isolated from brain tumor tissue removed from a 50-year-old Caucasian female during a frontal lobectomy. Pathology indicated recurrent grade 3 oligoastrocytoma with focal necrosis and extensive calcification. Patient history included a speech disturbance and epilepsy. The patient's brain had also been irradiated with a total dose of 5,082 cGy (Fraction 8). Family history included a brain tumor. |
| 49 | RATRNOT02 | This library was constructed using RNA isolated from the right atrium tissue of a 39-year-old Caucasian male, who died from a gunshot wound. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 50 | BRSTNOT02 | This library was constructed using RNA isolated from diseased breast tissue removed from a 55-year-old Caucasian female during a unilateral extended simple mastectomy. Pathology indicated proliferative fibrocystic changes characterized by apocrine metaplasia, sclerosing adenosis, cyst formation, and ductal hyperplasia without atypia. Pathology for the associated tumor tissue indicated an invasive grade 4 mammary adenocarcinoma. Patient history included atrial tachycardia and a benign neoplasm. Family history included cardiovascular and cerebrovascular disease. |
| 51 | BRSTNOT03 | This library was constructed using RNA isolated from diseased breast tissue removed from a 54-year-old Caucasian female during a bilateral radical mastectomy. Pathology for the associated tumor tissue indicated residual invasive grade 3 mammary ductal adenocarcinoma. Patient history included kidney infection and condyloma acuminatum. Family history included benign hypertension, hyperlipidemia and a malignant neoplasm of the colon. |
| 52 | COLNNOT13 | This library was constructed using RNA isolated from ascending colon tissue of a 28-year-old Caucasian male with moderate chronic ulcerative colitis. |
| 53 | COLNNOT13 | This library was constructed using RNA isolated from ascending colon tissue of a 28-year-old Caucasian male with moderate chronic ulcerative colitis. |
| 54 | PENITUT01 | This library was constructed using RNA isolated from tumor tissue removed from the penis of a 64-year-old Caucasian male during penile amputation. Pathology indicated a fungating invasive grade 4 squamous cell carcinoma involving the inner wall of the foreskin and extending onto the glans penis. Patient history included benign neoplasm of the large bowel, atherosclerotic coronary artery disease, angina pectoris, gout, and obesity. Family history included malignant pharyngeal neoplasm, chronic lymphocytic leukemia, and chronic liver disease. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 55 | SPLNNOT04 | This library was constructed using RNA isolated from the spleen tissue of a 2-year-old Hispanic male, who died from cerebral anoxia. |
| 56 | BRAITUT12 | This library was constructed using RNA isolated from brain tumor tissue removed from the left frontal lobe of a 40-year-old Caucasian female during excision of a cerebral meningeal lesion. Pathology indicated grade 4 gemistocytic astrocytoma. |
| 57 | URETTUT01 | This library was constructed using RNA isolated from right ureter tumor tissue of a 69-year-old Caucasian male during ureterectomy and lymph node excision. Pathology indicated invasive grade 3 transitional cell carcinoma. Patient history included benign colon neoplasm, tobacco use, asthma, emphysema, acute duodenal ulcer, and hyperplasia of the prostate. Family history included atherosclerotic coronary artery disease, congestive heart failure, and malignant lung neoplasm. |
| 58 | PROSNOT18 | This library was constructed using RNA isolated from diseased prostate tissue removed from a 58-year-old Caucasian male during a radical cystectomy, radical prostatectomy, and gastrostomy. Pathology indicated adenofibromatous hyperplasia; this tissue was associated with a grade 3 transitional cell carcinoma. Patient history included angina and emphysema. Family history included acute myocardial infarction, atherosclerotic coronary artery disease, and type II diabetes. |
| 59 | PITUNOT01 | This library was constructed using RNA obtained from Clontech (CLON 6584-2, lot 35278). The RNA was isolated from the pituitary glands removed from a pool of 18 male and female Caucasian donors, 16 to 70 years old, who died from trauma. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 60 | BRSTTUT03 | This library was constructed using RNA isolated from breast tumor tissue removed from a 58-year-old Caucasian female during a unilateral extended simple mastectomy. Pathology indicated multicentric invasive grade 4 lobular carcinoma. The mass was identified in the upper outer quadrant, and three separate nodules were found in the lower outer quadrant of the left breast. Patient history included skin cancer, rheumatic heart disease, osteoarthritis, and tuberculosis. Family history included cerebrovascular disease, coronary artery aneurysm, breast cancer, prostate cancer, atherosclerotic coronary artery disease, and type I diabetes. |
| 61 | OVARNOT03 | This library was constructed using RNA isolated from ovarian tissue removed from a 43-year-old Caucasian female during removal of the fallopian tubes and ovaries. Pathology for the associated tumor tissue indicated grade 2 mucinous cystadenocarcinoma. Patient history included mitral valve disorder, pneumonia, and viral hepatitis. Family history included atherosclerotic coronary artery disease, pancreatic cancer, stress reaction, cerebrovascular disease, breast cancer, and uterine cancer. |
| 62 | TESTTUT02 | This library was constructed using RNA isolated from testicular tumor tissue removed from a 31-year-old Caucasian male during unilateral orchiectomy. Pathology indicated embryonal carcinoma. |
| 63 | NPOLNOT01 | This library was constructed using RNA isolated from nasal polyp tissue removed from a 78-year-old Caucasian male during a nasal polypectomy. Pathology indicated a nasal polyp and striking eosinophilia. Patient history included asthma and nasal polyps. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 64 | OVRTUN01 | This normalized library was constructed from 5.36 million independent clones obtained from an ovarian tumor library. RNA was isolated from tumor tissue removed from the left ovary of a 58-year-old Caucasian female during a total abdominal hysterectomy, removal of a single ovary, and inguinal hernia repair. Pathology indicated a metastatic grade 3 adenocarcinoma of colonic origin, forming a partially cystic and necrotic tumor mass in the left ovary, and a nodule in the left mesovarium. A single intramural leiomyoma was identified in the myometrium. The cervix showed mild chronic cystic cervicitis. Patient history included benign hypertension, follicular ovarian cyst, colon cancer, benign colon neoplasm, and osteoarthritis. Family history included emphysema, myocardial infarction, atherosclerotic coronary artery disease, benign hypertension, hyperlipidemia, and primary tuberculous complex. The normalization and hybridization conditions were adapted from Soares et al. (PNAS (1994) 91:9228) and Bonaldo et al. (Genome Research (1996) 6:791). |
| 65 | LUNGNOT28 | This library was constructed using RNA isolated from lung tissue removed from a 53-year-old male. Pathology for the associated tumor tissue indicated grade 4 adenocarcinoma. |
| 66 | EPIGNOT01 | This library was constructed using RNA isolated from epiglottic tissue removed from a 71-year-old male during laryngectomy with right parathyroid biopsy. Pathology for the associated tumor tissue indicated recurrent grade 1 papillary thyroid carcinoma. |
| 67 | LIVRNOT03 | This library was constructed using RNA isolated from liver tissue removed from a Caucasian male fetus, who died from Patau's syndrome (trisomy 13) at 20 weeks' gestation. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 68 | CONFNOT03 | This library was constructed using RNA isolated from mesenteric fat tissue removed from a 71-year-old Caucasian male during a partial colectomy and permanent colostomy. Pathology indicated mesenteric fat tissue associated with diverticulosis and diverticulitis with abscess formation. Approximately 50 diverticula were noted, one of which was perforated and associated with abscess formation in adjacent mesenteric fat. The patient presented with atrial fibrillation. Patient history included viral hepatitis, a hemangioma, and diverticulitis of colon. Family history included extrinsic asthma, atherosclerotic coronary artery disease, and myocardial infarction. |
| 69 | COLSTUT01 | This library was constructed using RNA isolated from colon tumor tissue removed from the sigmoid colon of a 62-year-old Caucasian male during a sigmoidectomy and permanent colostomy. Pathology indicated invasive grade 2 adenocarcinoma, with invasion through the muscularis. Patient history included hyperlipidemia, cataract disorder and dermatitis. Family history included benign hypertension, atherosclerotic coronary artery disease, hyperlipidemia, breast cancer, and prostate cancer. |
| 70 | BRSTNOT33 | This library was constructed using RNA isolated from right breast tissue removed from a 46-year-old Caucasian female during a unilateral extended simple mastectomy with breast reconstruction. Pathology for the associated tumor tissue indicated invasive grade 3 adenocarcinoma, ductal type, with apocrine features, nuclear grade 3 forming a mass in the outer quadrant. There was greater than 50% intraductal component. Patient history included breast cancer. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|---|
| 71 | BRAINOT22 | This library was constructed using RNA isolated from right temporal lobe tissue removed from a 45-year-old Black male during a brain lobectomy. Pathology for the associated tumor tissue indicated dysembryoplastic neuroepithelial tumor of the right temporal lobe. The right temporal region dura was consistent with calcifying pseudotumor of the neuraxis. Patient history included obesity, meningitis, backache, unspecified sleep apnea, acute stress reaction, acquired knee deformity, and chronic sinusitis. Family history included obesity, benign hypertension, cirrhosis of the liver, obesity, hyperlipidemia, cerebrovascular disease, and type II diabetes. |
| 72 | LIVRDIR01 | This library was constructed using RNA isolated from diseased liver tissue removed from a 63-year-old Caucasian female during a liver transplant. Patient history included primary biliary cirrhosis. Serology was positive for anti-mitochondrial antibody. |
| 73 | COLADIT05 | This library was constructed using RNA isolated from diseased ascending colon tissue removed from a 32-year-old Caucasian male during a total intra-abdominal colectomy, abdominal-perineal rectal resection, and temporary ileostomy. Pathology indicated chronic ulcerative colitis extending in a continuous fashion from the mid-portion of the ascending colon distally to the rectum. This was characterized microscopically by crypt abscess formation and inflammation confined to the mucosa and submucosa. The terminal ileum exhibited ileitis and the rectal mucosa showed crypt abscess formation. Patient history included tobacco use. Family history included ulcerative colitis, malignant neoplasm of the breast and acute myocardial infarction. |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|---|
| 74 | SINITMT04 | <p>Library was constructed using RNA isolated from ileum tissue removed from a 70-year-old Caucasian female during right hemicolectomy, open liver biopsy, flexible sigmoidoscopy, colonoscopy, and permanent colostomy. Pathology indicated a non-tumorous margin of ileum. Pathology for the associated tumor indicated invasive grade 2 adenocarcinoma forming an ulcerated mass, situated 2 cm distal to the ileocecal valve. The tumor invaded through the muscularis propria just into the serosal adipose tissue. One (of 16) regional lymph node was positive for a microfocus of metastatic adenocarcinoma. Patient history included a malignant breast neoplasm, type II diabetes, hyperlipidemia, viral hepatitis, an unspecified thyroid disorder, osteoarthritis, and a malignant skin neoplasm. Family history included breast cancer, atherosclerotic coronary artery disease, benign hypertension, cerebrovascular disease, ovarian cancer, and hyperlipidemia.</p> |

Table 5

| Program | Description | Reference | Parameter Threshold |
|-------------------|---|--|---|
| ABI FACTURA | A program that removes vector sequences and masks ambiguous bases in nucleic acid sequences. | PE Biosystems, Foster City, CA. | |
| ABI/PARACEL FDF | A Fast Data Finder useful in comparing and annotating amino acid or nucleic acid sequences. | PE Biosystems, Foster City, CA; Paracel Inc., Pasadena, CA. | Mismatch <50% |
| ABI AutoAssembler | A program that assembles nucleic acid sequences. | PE Biosystems, Foster City, CA. | |
| BLAST | A Basic Local Alignment Search Tool useful in sequence similarity search for amino acid and nucleic acid sequences. BLAST includes five functions: blastp, blastn, blastx, tblastn, and tblastx. | Altschul, S.F. et al. (1990) J. Mol. Biol. 215:403-410; Altschul, S.F. et al. (1997) Nucleic Acids Res. 25:3389-3402. | ESTs: Probability value= 1.0E-8 or less Full Length sequences: Probability value= 1.0E-10 or less |
| FASTA | A Pearson and Lipman algorithm that searches for similarity between a query sequence and a group of sequences of the same type. FASTA comprises at least five functions: fasta, tfasta, fastx, tfastx, and ssearch. | Pearson, W.R. and D.J. Lipman (1988) Proc. Natl. Acad. Sci. USA 85:2444-2448; Pearson, W.R. (1990) Methods Enzymol. 183:63-98; and Smith, T.F. and M.S. Waterman (1981) Adv. Appl. Math. 2:482-489. | ESTs: fasta E value=1.06E-6 Assembled ESTs: fasta Identity= 95% or greater and Match length=200 bases or greater; fastx E value=1.0E-8 or less Full Length sequences: fastx score=100 or greater |
| BLIMPS | A BLocks IMProved Searcher that matches a sequence against those in BLOCKS, PRINTS, DOMO, PRODOM, and PFAM databases to search for gene families, sequence homology, and structural fingerprint regions. | Henikoff, S. and J.G. Henikoff (1991) Nucleic Acids Res. 19:6565-6572; Henikoff, J.G. and S. Henikoff (1996) Methods Enzymol. 266:88-105; and Attwood, T.K. et al. (1997) J. Chem. Inf. Comput. Sci. 37:417-424. | Score=1000 or greater; Ratio of Score/Strength = 0.75 or larger; and, if applicable, Probability value= 1.0E-3 or less |
| HMMER | An algorithm for searching a query sequence against hidden Markov model (HMM)-based databases of protein family consensus sequences, such as PFAM. | Krogh, A. et al. (1994) J. Mol. Biol. 235:1501-1531; Sonnhammer, E.L.L. et al. (1988) Nucleic Acids Res. 26:320-322. | Score=10-50 bits for PFAM hits, depending on individual protein families |

Table 5 (cont.)

| Program | Description | Reference | Parameter Threshold |
|-------------|---|--|---|
| ProfileScan | An algorithm that searches for structural and sequence motifs in protein sequences that match sequence patterns defined in Prosite. | Gribskov, M. et al. (1988) CABIOS 4:61-66; Gribskov, M. et al. (1989) Methods Enzymol. 183:146-159; Bairoch, A. et al. (1997) Nucleic Acids Res. 25:217-221. | Normalized quality score > GCG-specified "HIGH" value for that particular Prosite motif. Generally, score=1.4-2.1. |
| Phred | A base-calling algorithm that examines automated sequencer traces with high sensitivity and probability. | Ewing, B. et al. (1998) Genome Res. 8:175-185; Ewing, B. and P. Green (1998) Genome Res. 8:186-194. | |
| Phrap | A Phils Revised Assembly Program including SWAT and CrossMatch, programs based on efficient implementation of the Smith-Waterman algorithm, useful in searching sequence homology and assembling DNA sequences. | Smith, T.F. and M.S. Waterman (1981) Adv. Appl. Math. 2:482-489; Smith, T.F. and M.S. Waterman (1981) J. Mol. Biol. 147:195-197; and Green, P., University of Washington, Seattle, WA. | Score= 120 or greater; Match length= 56 or greater |
| Consed | A graphical tool for viewing and editing Phrap assemblies. | Gordon, D. et al. (1998) Genome Res. 8:195-202. | |
| SPScan | A weight matrix analysis program that scans protein sequences for the presence of secretory signal peptides. | Nielson, H. et al. (1997) Protein Engineering 10:1-6; Claverie, J.M. and S. Audic (1997) CABIOS 12:431-439. | Score=3.5 or greater |
| Motifs | A program that searches amino acid sequences for patterns that matched those defined in Prosite. | Bairoch, A. et al. (1997) Nucleic Acids Res. 25:217-221; Wisconsin Package Program Manual, version 9, page M51-59, Genetics Computer Group, Madison, WI. | |

What is claimed is:

1. An isolated polypeptide comprising an amino acid sequence selected from the group consisting of:

5 a) an amino acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:19, SEQ ID NO:20, SEQ ID NO:21, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:31, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:34, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:37,

b) a naturally occurring amino acid sequence having at least 70% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:19, SEQ ID NO:20, SEQ ID NO:21, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:31, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:34, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:37,

20 c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:19, SEQ ID NO:20, SEQ ID NO:21, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:31, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:34, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:37, and

d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:19, SEQ ID NO:20, SEQ ID NO:21, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:31, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:34, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:37.

35 2. An isolated polypeptide of claim 1 selected from the group consisting of SEQ ID NO:1,

SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:19, SEQ ID NO:20, SEQ ID NO:21, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:31, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:34, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:37.

3. An isolated polynucleotide encoding a polypeptide of claim 1.

10 4. An isolated polynucleotide encoding a polypeptide of claim 2.

5. An isolated polynucleotide of claim 4 selected from the group consisting of SEQ ID NO:38, SEQ ID NO:39, SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:44, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, SEQ ID NO:49, SEQ ID NO:50, SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:53, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, SEQ ID NO:58, SEQ ID NO:59, SEQ ID NO:60, SEQ ID NO:61, SEQ ID NO:62, SEQ ID NO:64, SEQ ID NO:65, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69, SEQ ID NO:70, SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:73, SEQ ID NO:74.

20 6. A recombinant polynucleotide comprising a promoter sequence operably linked to a polynucleotide of claim 3.

7. A cell transformed with a recombinant polynucleotide of claim 6.

25 8. A transgenic organism comprising a recombinant polynucleotide of claim 6.

9. A method for producing a polypeptide of claim 1, the method comprising:

- a) culturing a cell under conditions suitable for expression of the polypeptide, wherein said cell is transformed with a recombinant polynucleotide, and said recombinant polynucleotide comprises a promoter sequence operably linked to a polynucleotide encoding the polypeptide of claim 1, and
- b) recovering the polypeptide so expressed.

10. An isolated antibody which specifically binds to a polypeptide of claim 1.

35

11. An isolated polynucleotide comprising a polynucleotide sequence selected from the group consisting of:

- a) a polynucleotide sequence selected from the group consisting of SEQ ID NO:38, SEQ ID NO:39, SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:44, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, SEQ ID NO:49, SEQ ID NO:50, SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:53, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, SEQ ID NO:58, SEQ ID NO:59, SEQ ID NO:60, SEQ ID NO:61, SEQ ID NO:62, SEQ ID NO:64, SEQ ID NO:65, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69, SEQ ID NO:70, SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:73, SEQ ID NO:74,
- b) a naturally occurring polynucleotide sequence having at least 90% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:38, SEQ ID NO:39, SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:44, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, SEQ ID NO:49, SEQ ID NO:50, SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:53, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, SEQ ID NO:58, SEQ ID NO:59, SEQ ID NO:60, SEQ ID NO:61, SEQ ID NO:62, SEQ ID NO:64, SEQ ID NO:65, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69, SEQ ID NO:70, SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:73, SEQ ID NO:74,
- c) a polynucleotide sequence complementary to a),
- d) a polynucleotide sequence complementary to b), and
- e) an RNA equivalent of a)-d).

12. An isolated polynucleotide comprising at least 60 contiguous nucleotides of a polynucleotide of claim 11.

13. A method for detecting a target polynucleotide in a sample, said target polynucleotide having a sequence of a polynucleotide of claim 11, the method comprising:

- a) hybridizing the sample with a probe comprising at least 20 contiguous nucleotides comprising a sequence complementary to said target polynucleotide in the sample, and which probe specifically hybridizes to said target polynucleotide, under conditions whereby a hybridization complex is formed between said probe and said target polynucleotide or fragments thereof, and
- b) detecting the presence or absence of said hybridization complex, and, optionally, if present, the amount thereof.

14. A method of claim 13, wherein the probe comprises at least 60 contiguous nucleotides.

15. A method for detecting a target polynucleotide in a sample, said target polynucleotide having a sequence of a polynucleotide of claim 11, the method comprising:

a) amplifying said target polynucleotide or fragment thereof using polymerase chain reaction amplification, and

5 b) detecting the presence or absence of said amplified target polynucleotide or fragment thereof, and, optionally, if present, the amount thereof.

16. A composition comprising an effective amount of a polypeptide of claim 1 and a pharmaceutically acceptable excipient.

10

17. A composition of claim 16, wherein the polypeptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:19, SEQ ID NO:20, SEQ ID NO:21, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:31, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:34, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:37.

15

18. A method for treating a disease or condition associated with decreased expression of functional MEMAP, comprising administering to a patient in need of such treatment the composition of claim 16.

20

19. A method for screening a compound for effectiveness as an agonist of a polypeptide of claim 1, the method comprising:

25 a) exposing a sample comprising a polypeptide of claim 1 to a compound, and
b) detecting agonist activity in the sample.

20. A composition comprising an agonist compound identified by a method of claim 19 and a pharmaceutically acceptable excipient.

30

21. A method for treating a disease or condition associated with decreased expression of functional MEMAP, comprising administering to a patient in need of such treatment a composition of claim 20.

22. A method for screening a compound for effectiveness as an antagonist of a polypeptide

35

of claim 1, the method comprising:

- a) exposing a sample comprising a polypeptide of claim 1 to a compound, and
- b) detecting antagonist activity in the sample.

5 23. A composition comprising an antagonist compound identified by a method of claim 22 and a pharmaceutically acceptable excipient.

24. A method for treating a disease or condition associated with overexpression of functional MEMAP, comprising administering to a patient in need of such treatment a composition of claim 23.

10

25. A method of screening for a compound that specifically binds to the polypeptide of claim 1, said method comprising the steps of:

- a) combining the polypeptide of claim 1 with at least one test compound under suitable conditions, and
- 15 b) detecting binding of the polypeptide of claim 1 to the test compound, thereby identifying a compound that specifically binds to the polypeptide of claim 1.

26. A method of screening for a compound that modulates the activity of the polypeptide of claim 1, said method comprising:

- 20 a) combining the polypeptide of claim 1 with at least one test compound under conditions permissive for the activity of the polypeptide of claim 1,
- b) assessing the activity of the polypeptide of claim 1 in the presence of the test compound, and
- c) comparing the activity of the polypeptide of claim 1 in the presence of the test compound
- 25 with the activity of the polypeptide of claim 1 in the absence of the test compound, wherein a change in the activity of the polypeptide of claim 1 in the presence of the test compound is indicative of a compound that modulates the activity of the polypeptide of claim 1.

27. A method for screening a compound for effectiveness in altering expression of a target polynucleotide, wherein said target polynucleotide comprises a sequence of claim 5, the method comprising:

- 30 a) exposing a sample comprising the target polynucleotide to a compound, and
- b) detecting altered expression of the target polynucleotide.

35 28. A method for assessing toxicity of a test compound, said method comprising:

- a) treating a biological sample containing nucleic acids with the test compound;
- b) hybridizing the nucleic acids of the treated biological sample with a probe comprising at least 20 contiguous nucleotides of a polynucleotide of claim 11 under conditions whereby a specific hybridization complex is formed between said probe and a target polynucleotide in the biological sample, said target polynucleotide comprising a polynucleotide sequence of a polynucleotide of claim 11 or fragment thereof;
- c) quantifying the amount of hybridization complex; and
- d) comparing the amount of hybridization complex in the treated biological sample with the amount of hybridization complex in an untreated biological sample, wherein a difference in the amount of hybridization complex in the treated biological sample is indicative of toxicity of the test compound.

SEQUENCE LISTING

<110> INCYTE GENOMICS, INC.

LAL, Preeti
YUE, Henry
TANG, Y. Tom
BANDMAN, Olga
BURFORD, Neil
AZIMZAI, Yalda
BAUGHN, Mariah R.
LU, Dyung Aina M.
PATTERSON, Chandra

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| | 35 | 40 | 45 |
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| | 50 | 55 | 60 |
| Ala Lys Ser Arg | Gln Leu Arg Gln Leu | Leu Glu Lys Val | Gln Asn |
| | 65 | 70 | 75 |
| Met Ser Gln Ser | Ile Glu Val Leu Asn | Leu Arg Thr Gln | Arg Asp |
| | 80 | 85 | 90 |
| Phe Gln Tyr Val | Leu Lys Met Glu Thr | Gln Met Lys Gly | Leu Lys |
| | 95 | 100 | 105 |
| Ala Lys Phe Arg | Gln Ile Glu Asp Asp | Arg Lys Thr Leu | Met Thr |
| | 110 | 115 | 120 |
| Lys His Phe Gln | Glu Leu Lys Glu Lys | Met Asp Glu Leu | Leu Pro |
| | 125 | 130 | 135 |
| Leu Ile Pro Val | Leu Glu Gln Tyr Lys | Thr Asp Ala Lys | Leu Ile |
| | 140 | 145 | 150 |
| Thr Gln Phe Lys | Glu Glu Ile Arg Asn | Leu Ser Ala Val | Leu Thr |
| | 155 | 160 | 165 |
| Gly Ile Gln Glu | Glu Ile Gly Ala Tyr | Asp Tyr Glu Glu | Leu His |
| | 170 | 175 | 180 |
| Gln Arg Val Leu | Ser Leu Glu Thr Arg | Leu Arg Asp Cys | Met Lys |
| | 185 | 190 | 195 |
| Lys Leu Thr Cys | Gly Lys Leu Met Lys | Ile Thr Gly Pro | Val Thr |
| | 200 | 205 | 210 |
| Val Lys Thr Ser | Gly Thr Arg Phe Gly | Ala Trp Met Thr | Asp Pro |
| | 215 | 220 | 225 |

```

Leu Ala Ser Glu Lys Asn Asn Arg Val Trp Tyr Met Asp Ser Tyr
230 235 240
Thr Asn Asn Lys Ile Val Arg Glu Tyr Lys Ser Ile Ala Asp Phe
245 250 255
Val Ser Gly Ala Glu Ser Arg Thr Tyr Asn Leu Pro Phe Lys Trp
260 265 270
Ala Gly Thr Asn His Val Val Tyr Asn Gly Ser Leu Tyr Phe Asn
275 280 285
Lys Tyr Gln Ser Asn Ile Ile Ile Lys Tyr Ser Phe Asp Met Gly
290 295 300
Arg Val Leu Ala Gln Arg Ser Leu Glu Tyr Ala Gly Phe His Asn
305 310 315
Val Tyr Pro Tyr Thr Trp Gly Gly Phe Ser Asp Ile Asp Leu Met
320 325 330
Ala Asp Glu Ile Gly Leu Trp Ala Val Tyr Ala Thr Asn Gln Asn
335 340 345
Ala Gly Asn Ile Val Ile Ser Gln Leu Asn Gln Asp Thr Leu Glu
350 355 360
Val Met Lys Ser Trp Ser Thr Gly Tyr Pro Lys Arg Ser Ala Gly
365 370 375
Glu Ser Phe Met Ile Cys Gly Thr Leu Tyr Val Thr Asn Ser His
380 385 390
Leu Thr Gly Ala Lys Val Tyr Tyr Ser Tyr Ser Thr Lys Thr Ser
395 400 405
Thr Tyr Glu Tyr Thr Asp Ile Pro Phe His Asn Gln Tyr Phe His
410 415 420
Ile Ser Met Leu Asp Tyr Asn Ala Arg Asp Arg Ala Leu Tyr Ala
425 430 435
Trp Asn Asn Gly His Gln Val Leu Phe Asn Val Thr Leu Phe His
440 445 450
Ile Ile Lys Thr Glu Asp Asp Thr
455

```

<210> 3

<211> 219

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1521513CD1

<400> 3

```

Met Asn Ser Ser Lys Ser Ser Glu Thr Gln Cys Thr Glu Arg Gly
1 5 10 15
Cys Phe Ser Ser Gln Met Phe Leu Trp Thr Val Ala Gly Ile Pro
20 25 30
Ile Leu Phe Leu Ser Ala Cys Phe Ile Thr Arg Cys Val Val Thr
35 40 45
Phe Arg Ile Phe Gln Thr Cys Asp Glu Lys Lys Phe Gln Leu Pro
50 55 60
Glu Asn Phe Thr Glu Leu Ser Cys Tyr Asn Tyr Gly Ser Gly Ser
65 70 75
Val Lys Asn Cys Cys Pro Leu Asn Trp Glu Tyr Phe Gln Ser Ser
80 85 90
Cys Tyr Phe Phe Ser Thr Asp Thr Ile Ser Trp Ala Leu Ser Leu
95 100 105
Lys Asn Cys Ser Ala Met Gly Ala His Leu Val Val Ile Asn Ser
110 115 120
Gln Glu Glu Gln Glu Phe Leu Ser Tyr Lys Lys Pro Lys Met Arg
125 130 135
Glu Phe Phe Ile Gly Leu Ser Asp Gln Val Val Glu Gly Gln Trp
140 145 150
Gln Trp Val Asp Gly Thr Pro Leu Thr Lys Ser Leu Ser Phe Trp

```


| | | | | | |
|-----------------|-----|---------------------|-----|---------------------|-----|
| Asp Val Gly Glu | 155 | Pro Asn Asn Ile Ala | 160 | Thr Leu Glu Asp Cys | 165 |
| Thr Met Arg Asp | 170 | Ser Ser Asn Pro Arg | 175 | Gln Asn Trp Asn Asp | 180 |
| Thr Cys Phe Leu | 185 | Asn Tyr Phe Arg Ile | 190 | Cys Glu Met Val Gly | 195 |
| Asn Pro Leu Asn | 200 | Lys Gly Lys Ser Leu | 205 | | 210 |
| | 215 | | | | |

<210> 4

<211> 276

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1863994CD1

<400> 4

| | | | | | |
|-----------------|-----|-----------------|-----|-----------------|-----|
| Met Glu Ser Arg | Met | Trp Pro Ala Leu | Leu | Leu Ser His Leu | Leu |
| 1 | 5 | 10 | 15 | | |
| Pro Leu Trp Pro | Leu | Leu Leu Leu Pro | Leu | Pro Pro Pro Ala | Gln |
| | 20 | 25 | 30 | | |
| Gly Ser Ser Ser | Ser | Pro Arg Thr Pro | Pro | Ala Pro Ala Arg | Pro |
| | 35 | 40 | 45 | | |
| Pro Cys Ala Arg | Gly | Gly Pro Ser Ala | Pro | Arg His Val Cys | Val |
| | 50 | 55 | 60 | | |
| Trp Glu Arg Ala | Pro | Pro Pro Ser Arg | Ser | Pro Arg Val Pro | Arg |
| | 65 | 70 | 75 | | |
| Ser Arg Arg Gln | Val | Leu Pro Gly Thr | Ala | Pro Pro Ala Thr | Pro |
| | 80 | 85 | 90 | | |
| Ser Gly Phe Glu | Glu | Gly Pro Pro Ser | Ser | Gln Tyr Pro Trp | Ala |
| | 95 | 100 | 105 | | |
| Ile Val Trp Gly | Pro | Thr Val Ser Arg | Glu | Asp Gly Gly Asp | Pro |
| | 110 | 115 | 120 | | |
| Asn Ser Ala Asn | Pro | Gly Phe Leu Asp | Tyr | Gly Phe Ala Ala | Pro |
| | 125 | 130 | 135 | | |
| His Gly Leu Ala | Thr | Pro His Pro Asn | Ser | Asp Ser Met Arg | Gly |
| | 140 | 145 | 150 | | |
| Asp Gly Asp Gly | Leu | Ile Leu Gly Glu | Ala | Pro Ala Thr Leu | Arg |
| | 155 | 160 | 165 | | |
| Pro Phe Leu Phe | Gly | Gly Arg Gly Glu | Gly | Val Asp Pro Gln | Leu |
| | 170 | 175 | 180 | | |
| Tyr Val Thr Ile | Thr | Ile Ser Ile Ile | Ile | Val Leu Val Ala | Thr |
| | 185 | 190 | 195 | | |
| Gly Ile Ile Phe | Lys | Phe Cys Trp Asp | Arg | Ser Gln Lys Arg | Arg |
| | 200 | 205 | 210 | | |
| Arg Pro Ser Gly | Gln | Gln Gly Ala Leu | Arg | Gln Glu Glu Ser | Gln |
| | 215 | 220 | 225 | | |
| Gln Pro Leu Thr | Asp | Leu Ser Pro Ala | Gly | Val Thr Val Leu | Gly |
| | 230 | 235 | 240 | | |
| Ala Phe Gly Asp | Ser | Pro Thr Pro Thr | Pro | Asp His Glu Glu | Pro |
| | 245 | 250 | 255 | | |
| Arg Gly Gly Pro | Arg | Pro Gly Met Pro | His | Pro Lys Gly Ala | Pro |
| | 260 | 265 | 270 | | |
| Ala Phe Gln Leu | Asn | Arg | | | |
| | 275 | | | | |

<210> 5

<211> 375

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2071941CD1

<400> 5

```

Met Ser Ser His Lys Gly Ser Val Val Ala Gln Gly Asn Gly Ala
 1          5          10          15
Pro Ala Ser Asn Arg Glu Ala Asp Thr Val Glu Leu Ala Glu Leu
          20          25          30
Gly Pro Leu Leu Glu Glu Lys Gly Lys Arg Val Ile Ala Asn Pro
          35          40          45
Pro Lys Ala Glu Glu Glu Gln Thr Cys Pro Val Pro Gln Glu Glu
          50          55          60
Glu Glu Glu Val Arg Val Leu Thr Leu Pro Leu Gln Ala His His
          65          70          75
Ala Met Glu Lys Met Glu Glu Phe Val Tyr Lys Val Trp Glu Gly
          80          85          90
Arg Trp Arg Val Ile Pro Tyr Asp Val Leu Pro Asp Trp Leu Lys
          95          100          105
Asp Asn Asp Tyr Leu Leu His Gly His Arg Pro Pro Met Pro Ser
          110          115          120
Phe Arg Ala Cys Phe Lys Ser Ile Phe Arg Ile His Thr Glu Thr
          125          130          135
Gly Asn Ile Trp Thr His Leu Leu Gly Phe Val Leu Phe Leu Phe
          140          145          150
Leu Gly Ile Leu Thr Met Leu Arg Pro Asn Met Tyr Phe Met Ala
          155          160          165
Pro Leu Gln Glu Lys Val Val Phe Gly Met Phe Phe Leu Gly Ala
          170          175          180
Val Leu Cys Leu Ser Phe Ser Trp Leu Phe His Thr Val Tyr Cys
          185          190          195
His Ser Glu Lys Val Ser Arg Thr Phe Ser Lys Leu Asp Tyr Ser
          200          205          210
Gly Ile Ala Leu Leu Ile Met Gly Ser Phe Val Pro Trp Leu Tyr
          215          220          225
Tyr Ser Phe Tyr Cys Ser Pro Gln Pro Arg Leu Ile Tyr Leu Ser
          230          235          240
Ile Val Cys Val Leu Gly Ile Ser Ala Ile Ile Val Ala Gln Trp
          245          250          255
Asp Arg Phe Ala Thr Pro Lys His Arg Gln Thr Arg Ala Gly Val
          260          265          270
Phe Leu Gly Leu Gly Leu Ser Gly Val Val Pro Thr Met His Phe
          275          280          285
Thr Ile Ala Glu Gly Phe Val Lys Ala Thr Thr Val Gly Gln Met
          290          295          300
Gly Trp Phe Phe Leu Met Ala Val Met Tyr Ile Thr Gly Ala Gly
          305          310          315
Leu Tyr Ala Ala Arg Ile Pro Glu Arg Phe Phe Pro Gly Lys Phe
          320          325          330
Asp Ile Trp Phe Gln Ser His Gln Ile Phe His Val Leu Val Val
          335          340          345
Ala Ala Ala Phe Val His Phe Tyr Gly Val Ser Asn Leu Gln Glu
          350          355          360
Phe Arg Tyr Gly Leu Glu Gly Gly Cys Thr Asp Asp Thr Leu Leu
          365          370          375

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<210> 6

<211> 249

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2172512CD1

<400> 6

```

Met Ser Gly Val Val Pro Thr Ala Pro Glu Gln Pro Ala Gly Glu
 1          5          10          15
Met Glu Asn Gln Thr Lys Pro Pro Asp Pro Arg Pro Asp Ala Pro
          20          25          30
Pro Glu Tyr Ser Ser His Phe Leu Pro Gly Pro Pro Gly Thr Ala
          35          40          45
Val Pro Pro Pro Thr Gly Tyr Pro Gly Gly Leu Pro Met Gly Tyr
          50          55          60
Tyr Ser Pro Gln Gln Pro Ser Thr Phe Pro Leu Tyr Gln Pro Val
          65          70          75
Gly Gly Ile His Pro Val Arg Tyr Gln Pro Gly Lys Tyr Pro Met
          80          85          90
Pro Asn Gln Ser Val Pro Ile Thr Trp Met Pro Gly Pro Thr Pro
          95          100          105
Met Ala Asn Cys Pro Pro Gly Leu Glu Tyr Leu Val Gln Leu Asp
          110          115          120
Asn Ile His Val Leu Gln His Phe Glu Pro Leu Glu Met Met Thr
          125          130          135
Cys Phe Glu Thr Asn Asn Arg Tyr Asp Ile Lys Asn Asn Ser Asp
          140          145          150
Gln Met Val Tyr Ile Val Thr Glu Asp Thr Asp Asp Phe Thr Arg
          155          160          165
Asn Ala Tyr Arg Thr Leu Arg Pro Phe Val Leu Arg Val Thr Asp
          170          175          180
Cys Met Gly Arg Glu Ile Met Thr Met Gln Arg Pro Phe Arg Cys
          185          190          195
Thr Cys Cys Cys Phe Cys Cys Pro Ser Ala Arg Gln Glu Leu Glu
          200          205          210
Val Gln Cys Pro Pro Gly Val Thr Ile Gly Phe Val Ala Glu His
          215          220          225
Trp Asn Leu Cys Arg Ala Val Tyr Ser Ile Gln Lys Lys Lys Lys
          230          235          240
Lys Ile Ala Ala Gln Ala Tyr Ser Leu
          245

```

<210> 7

<211> 353

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2483172CD1

<400> 7

```

Met Ala Met Thr Leu Leu Glu Asp Trp Cys Arg Gly Met Asp Val
 1          5          10          15
Asn Ser Gln Arg Ala Leu Leu Val Trp Gly Ile Pro Val Asn Cys
          20          25          30
Asp Glu Ala Glu Ile Glu Glu Thr Leu Gln Ala Ala Met Pro Gln
          35          40          45
Val Ser Tyr Arg Met Leu Gly Arg Met Phe Trp Arg Glu Glu Asn
          50          55          60
Ala Lys Ala Ala Leu Leu Glu Leu Thr Gly Ala Val Asp Tyr Ala
          65          70          75
Ala Ile Pro Arg Glu Met Pro Gly Lys Gly Gly Val Trp Lys Val
          80          85          90
Leu Phe Lys Pro Pro Thr Ser Asp Ala Glu Phe Leu Glu Arg Leu
          95          100          105
His Leu Phe Leu Ala Arg Glu Gly Trp Thr Val Gln Asp Val Ala
          110          115          120
Arg Val Leu Gly Phe Gln Asn Pro Thr Pro Thr Pro Gly Pro Glu
          125          130          135

```

```

Met Pro Ala Glu Met Leu Asn Tyr Ile Leu Asp Asn Val Ile Gln
      140      145      150
Pro Leu Val Glu Ser Ile Trp Tyr Lys Arg Leu Thr Leu Phe Ser
      155      160      165
Gly Arg Asp Ile Pro Gly Pro Gly Glu Glu Thr Phe Asp Pro Trp
      170      175      180
Leu Glu His Thr Asn Glu Val Leu Glu Glu Trp Gln Val Ser Asp
      185      190      195
Val Glu Lys Arg Arg Arg Leu Met Glu Ser Leu Arg Gly Pro Ala
      200      205      210
Ala Asp Val Ile Arg Ile Leu Lys Ser Asn Asn Pro Ala Ile Thr
      215      220      225
Thr Ala Glu Cys Leu Lys Ala Leu Glu Gln Val Phe Gly Ser Val
      230      235      240
Glu Ser Ser Arg Asp Ala Gln Ile Lys Phe Leu Asn Thr Tyr Gln
      245      250      255
Asn Pro Gly Glu Lys Leu Ser Ala Tyr Val Ile Arg Leu Glu Pro
      260      265      270
Leu Leu Gln Lys Val Val Glu Lys Gly Ala Ile Asp Lys Asp Asn
      275      280      285
Val Asn Gln Ala Arg Leu Glu Gln Val Ile Ala Gly Ala Asn His
      290      295      300
Ser Gly Ala Ile Arg Arg Gln Leu Trp Leu Thr Gly Ala Gly Glu
      305      310      315
Gly Pro Ala Pro Asn Leu Phe Gln Leu Leu Val Gln Ile Arg Glu
      320      325      330
Glu Glu Ala Lys Glu Glu Glu Glu Ala Glu Ala Thr Leu Leu
      335      340      345
Gln Leu Gly Leu Glu Gly His Phe
      350

```

<210> 8

<211> 194

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2656128CD1

<400> 8

```

Met His Asp Ser Asn Asn Val Glu Lys Asp Ile Thr Pro Ser Glu
  1      5      10      15
Leu Pro Ala Asn Pro Gly Cys Leu His Ser Lys Glu His Ser Ile
      20      25      30
Lys Ala Thr Leu Ile Trp Arg Leu Phe Phe Leu Ile Met Phe Leu
      35      40      45
Thr Ile Ile Val Cys Gly Met Val Ala Ala Leu Ser Ala Ile Arg
      50      55      60
Ala Asn Cys His Gln Glu Pro Ser Val Cys Leu Gln Ala Ala Cys
      65      70      75
Pro Glu Ser Trp Ile Gly Phe Gln Arg Lys Cys Phe Tyr Phe Ser
      80      85      90
Asp Asp Thr Lys Asn Trp Thr Ser Ser Gln Arg Phe Cys Asp Ser
      95      100      105
Gln Asp Ala Asp Leu Ala Gln Val Glu Ser Phe Gln Glu Leu Asn
      110      115      120
Phe Leu Leu Arg Tyr Lys Gly Pro Ser Asp His Trp Ile Gly Leu
      125      130      135
Ser Arg Glu Gln Gly Gln Pro Trp Lys Trp Ile Asn Gly Thr Glu
      140      145      150
Trp Thr Arg Gln Leu Val Met Lys Glu Asp Gly Ala Asn Leu Tyr
      155      160      165
Val Ala Lys Val Ser Gln Val Pro Arg Met Asn Pro Arg Pro Val

```

| | | | | | |
|-----------------|---------------------|---------------------|-----|--|-----|
| | 170 | | 175 | | 180 |
| Met Val Ser Tyr | Pro Gly Ser Arg Arg | Val Cys Leu Phe Glu | | | |
| | 185 | | 190 | | |

<210> 9

<211> 322

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 5855841CD1

<400> 9

| | | |
|---|-----|-----|
| Met Ser Ser Leu Gly Gly Gly Ser Gln Asp Ala Gly Gly Ser Ser | | |
| 1 | 5 | 10 |
| Ser Ser Ser Thr Asn Gly Ser Gly Gly Ser Gly Ser Ser Gly Pro | | |
| | 20 | 25 |
| Lys Ala Gly Ala Ala Asp Lys Ser Ala Val Val Ala Ala Ala Ala | | |
| | 35 | 40 |
| Pro Ala Ser Val Ala Asp Asp Thr Pro Pro Glu Arg Arg Asn | | |
| | 50 | 55 |
| Lys Ser Gly Ile Ile Ser Glu Pro Leu Asn Lys Ser Leu Arg Arg | | |
| | 65 | 70 |
| Ser Arg Pro Leu Ser His Tyr Ser Ser Phe Gly Ser Ser Gly Gly | | |
| | 80 | 85 |
| Ser Gly Gly Gly Ser Met Met Gly Gly Glu Ser Ala Asp Lys Ala | | |
| | 95 | 100 |
| Thr Ala Ala Ala Ala Ala Ala Ser Leu Leu Ala Asn Gly His Asp | | |
| | 110 | 115 |
| Leu Ala Ala Ala Met Ala Val Asp Lys Ser Asn Pro Thr Ser Lys | | |
| | 125 | 130 |
| His Lys Ser Gly Ala Val Ala Ser Leu Leu Ser Lys Ala Glu Arg | | |
| | 140 | 145 |
| Ala Thr Glu Leu Ala Ala Glu Gly Gln Leu Thr Leu Gln Gln Phe | | |
| | 155 | 160 |
| Ala Gln Ser Thr Glu Met Leu Lys Arg Val Val Gln Glu His Leu | | |
| | 170 | 175 |
| Pro Leu Met Ser Glu Ala Gly Ala Gly Leu Pro Asp Met Glu Ala | | |
| | 185 | 190 |
| Val Ala Gly Ala Glu Ala Leu Asn Gly Gln Ser Asp Phe Pro Tyr | | |
| | 200 | 205 |
| Leu Gly Ala Phe Pro Ile Asn Pro Gly Leu Phe Ile Met Thr Pro | | |
| | 215 | 220 |
| Ala Gly Val Phe Leu Ala Glu Ser Ala Leu His Met Ala Gly Leu | | |
| | 230 | 235 |
| Ala Glu Tyr Pro Met Gln Gly Glu Leu Ala Ser Ala Ile Ser Ser | | |
| | 245 | 250 |
| Gly Lys Lys Lys Arg Lys Arg Cys Gly Met Cys Ala Pro Cys Arg | | |
| | 260 | 265 |
| Arg Arg Ile Asn Cys Glu Gln Cys Ser Ser Cys Arg Asn Arg Lys | | |
| | 275 | 280 |
| Thr Gly His Gln Ile Cys Lys Phe Arg Lys Cys Glu Glu Leu Lys | | |
| | 290 | 295 |
| Lys Lys Pro Ser Ala Ala Leu Glu Lys Val Met Leu Pro Thr Gly | | |
| | 305 | 310 |
| Ala Ala Phe Arg Trp Phe Gln | | |
| | 320 | |

<210> 10

<211> 335

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 603462CD1

<400> 10

```

Met Leu Gln Gly His Ser Ser Val Phe Gln Ala Leu Leu Gly Thr
 1          5          10          15
Phe Phe Thr Trp Gly Met Thr Ala Ala Gly Ala Ala Leu Val Phe
          20          25          30
Val Phe Ser Ser Gly Gln Arg Arg Ile Leu Asp Gly Ser Leu Gly
          35          40          45
Phe Ala Ala Gly Val Met Leu Ala Ala Ser Tyr Trp Ser Leu Leu
          50          55          60
Ala Pro Ala Val Glu Met Ala Thr Ser Ser Gly Gly Phe Gly Ala
          65          70          75
Phe Ala Phe Phe Pro Val Ala Val Gly Phe Thr Leu Gly Ala Ala
          80          85          90
Phe Val Tyr Leu Ala Asp Leu Leu Met Pro His Leu Gly Ala Ala
          95          100          105
Glu Asp Pro Gln Thr Ala Leu Ala Leu Asn Phe Gly Ser Thr Leu
          110          115          120
Met Lys Lys Lys Ser Asp Pro Glu Gly Pro Ala Leu Leu Phe Pro
          125          130          135
Glu Ser Glu Leu Ser Ile Arg Ile Asp Lys Ser Glu Asn Gly Glu
          140          145          150
Ala Tyr Gln Arg Lys Lys Ala Ala Ala Thr Gly Leu Pro Glu Gly
          155          160          165
Pro Ala Val Pro Val Pro Ser Arg Gly Asn Leu Ala Gln Pro Gly
          170          175          180
Gly Ser Ser Trp Arg Arg Ile Ala Leu Leu Ile Leu Ala Ile Thr
          185          190          195
Ile His Asn Val Pro Glu Gly Leu Ala Val Gly Val Gly Phe Gly
          200          205          210
Ala Ile Glu Lys Thr Ala Ser Ala Thr Phe Glu Ser Ala Arg Asn
          215          220          225
Leu Ala Ile Gly Ile Gly Ile Gln Asn Phe Pro Glu Gly Leu Ala
          230          235          240
Val Ser Leu Pro Leu Arg Gly Ala Gly Phe Ser Thr Trp Arg Ala
          245          250          255
Phe Trp Tyr Gly Gln Leu Ser Gly Met Val Glu Pro Leu Ala Gly
          260          265          270
Val Phe Gly Ala Phe Ala Val Val Leu Ala Glu Pro Ile Leu Pro
          275          280          285
Tyr Ala Leu Ala Phe Ala Ala Gly Ala Met Val Tyr Val Val Met
          290          295          300
Asp Asp Ile Ile Pro Glu Ala Gln Ile Ser Gly Asn Gly Lys Leu
          305          310          315
Ala Ser Trp Ala Ser Ile Leu Gly Phe Val Val Met Met Ser Leu
          320          325          330
Asp Val Gly Leu Gly
          335

```

<210> 11

<211> 620

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 747681CD1

<400> 11

```

Met Gln Val Ser Lys Arg Met Leu Ala Gly Gly Val Arg Ser Met
 1          5          10          15
Pro Ser Pro Leu Leu Ala Cys Trp Gln Pro Ile Leu Leu Leu Val

```

| | | | | | |
|-----------------|---|--|-----|--|-----|
| | 20 | | 25 | | 30 |
| Leu Gly Ser Val | Leu Ser Gly Ser Ala Thr Gly Cys Pro Pro Arg | | | | |
| | 35 | | 40 | | 45 |
| Cys Glu Cys Ser | Ala Gln Asp Arg Ala Val Leu Cys His Arg Lys | | | | |
| | 50 | | 55 | | 60 |
| Arg Phe Val Ala | Val Pro Glu Gly Ile Pro Thr Glu Thr Arg Leu | | | | |
| | 65 | | 70 | | 75 |
| Leu Asp Leu Gly | Lys Asn Arg Ile Lys Thr Leu Asn Gln Asp Glu | | | | |
| | 80 | | 85 | | 90 |
| Phe Ala Ser Phe | Pro His Leu Glu Glu Leu Glu Leu Asn Glu Asn | | | | |
| | 95 | | 100 | | 105 |
| Ile Val Ser Ala | Val Glu Pro Gly Ala Phe Asn Asn Leu Phe Asn | | | | |
| | 110 | | 115 | | 120 |
| Leu Arg Thr Leu | Gly Leu Arg Ser Asn Arg Leu Lys Leu Ile Pro | | | | |
| | 125 | | 130 | | 135 |
| Leu Gly Val Phe | Thr Gly Leu Ser Asn Leu Thr Lys Leu Asp Ile | | | | |
| | 140 | | 145 | | 150 |
| Ser Glu Asn Lys | Ile Val Ile Leu Leu Asp Tyr Met Phe Gln Asp | | | | |
| | 155 | | 160 | | 165 |
| Leu Tyr Asn Leu | Lys Ser Leu Glu Val Gly Asp Asn Asp Leu Val | | | | |
| | 170 | | 175 | | 180 |
| Tyr Ile Ser His | Arg Ala Phe Ser Gly Leu Asn Ser Leu Glu Gln | | | | |
| | 185 | | 190 | | 195 |
| Leu Thr Leu Glu | Lys Cys Asn Leu Thr Ser Ile Pro Thr Glu Ala | | | | |
| | 200 | | 205 | | 210 |
| Leu Ser His Leu | His Gly Leu Ile Val Leu Arg Leu Arg His Leu | | | | |
| | 215 | | 220 | | 225 |
| Asn Ile Asn Ala | Ile Arg Asp Tyr Ser Phe Lys Arg Leu Tyr Arg | | | | |
| | 230 | | 235 | | 240 |
| Leu Lys Val Leu | Glu Ile Ser His Trp Pro Tyr Leu Asp Thr Met | | | | |
| | 245 | | 250 | | 255 |
| Thr Pro Asn Cys | Leu Tyr Gly Leu Asn Leu Thr Ser Leu Ser Ile | | | | |
| | 260 | | 265 | | 270 |
| Thr His Cys Asn | Leu Thr Ala Val Pro Tyr Leu Ala Val Arg His | | | | |
| | 275 | | 280 | | 285 |
| Leu Val Tyr Leu | Arg Phe Leu Asn Leu Ser Tyr Asn Pro Ile Ser | | | | |
| | 290 | | 295 | | 300 |
| Thr Ile Glu Gly | Ser Met Leu His Glu Leu Leu Arg Leu Gln Glu | | | | |
| | 305 | | 310 | | 315 |
| Ile Gln Leu Val | Gly Gly Gln Leu Ala Val Val Glu Pro Tyr Ala | | | | |
| | 320 | | 325 | | 330 |
| Phe Arg Gly Leu | Asn Tyr Leu Arg Val Leu Asn Val Ser Gly Asn | | | | |
| | 335 | | 340 | | 345 |
| Gln Leu Thr Thr | Leu Glu Glu Ser Val Phe His Ser Val Gly Asn | | | | |
| | 350 | | 355 | | 360 |
| Leu Glu Thr Leu | Ile Leu Asp Ser Asn Pro Leu Ala Cys Asp Cys | | | | |
| | 365 | | 370 | | 375 |
| Arg Leu Leu Trp | Val Phe Arg Arg Arg Trp Arg Leu Asn Phe Asn | | | | |
| | 380 | | 385 | | 390 |
| Arg Gln Gln Pro | Thr Cys Ala Thr Pro Glu Phe Val Gln Gly Lys | | | | |
| | 395 | | 400 | | 405 |
| Glu Phe Lys Asp | Phe Pro Asp Val Leu Leu Pro Asn Tyr Phe Thr | | | | |
| | 410 | | 415 | | 420 |
| Cys Arg Arg Ala | Arg Ile Arg Asp Arg Lys Ala Gln Gln Val Phe | | | | |
| | 425 | | 430 | | 435 |
| Val Asp Glu Gly | His Thr Val Gln Phe Val Cys Arg Ala Asp Gly | | | | |
| | 440 | | 445 | | 450 |
| Asp Pro Pro Pro | Ala Ile Leu Trp Leu Ser Pro Arg Lys His Leu | | | | |
| | 455 | | 460 | | 465 |
| Val Ser Ala Lys | Ser Asn Gly Arg Leu Thr Val Phe Pro Asp Gly | | | | |
| | 470 | | 475 | | 480 |
| Thr Leu Glu Val | Arg Tyr Ala Gln Val Gln Asp Asn Gly Thr Tyr | | | | |
| | 485 | | 490 | | 495 |

```

Leu Cys Ile Ala Ala Asn Ala Gly Gly Asn Asp Ser Met Pro Ala
      500      505      510
His Leu His Val Arg Ser Tyr Ser Pro Asp Trp Pro His Gln Pro
      515      520      525
Asn Lys Thr Phe Ala Phe Ile Ser Asn Gln Pro Gly Glu Gly Glu
      530      535      540
Ala Asn Ser Thr Arg Ala Thr Val Pro Phe Pro Phe Asp Ile Lys
      545      550      555
Thr Leu Ile Ile Ala Thr Thr Met Gly Phe Ile Ser Phe Leu Gly
      560      565      570
Val Val Leu Phe Cys Leu Val Leu Leu Phe Leu Trp Ser Arg Gly
      575      580      585
Lys Gly Asn Thr Lys His Asn Ile Glu Ile Glu Tyr Val Pro Arg
      590      595      600
Lys Ser Asp Ala Gly Ile Ser Ser Ala Asp Ala Pro Arg Lys Phe
      605      610      615
Asn Met Lys Met Ile
      620

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<210> 12

<211> 491

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 919469CD1

<400> 12

```

Met Ala Gly Gln Gly Leu Pro Leu His Val Ala Thr Leu Leu Thr
  1      5      10      15
Gly Leu Leu Glu Cys Leu Gly Phe Ala Gly Val Leu Phe Gly Trp
      20      25      30
Pro Ser Leu Val Phe Val Phe Lys Asn Glu Asp Tyr Phe Lys Asp
      35      40      45
Leu Cys Gly Pro Asp Ala Gly Pro Ile Gly Asn Ala Thr Gly Gln
      50      55      60
Ala Asp Cys Lys Ala Gln Asp Glu Arg Phe Ser Leu Ile Phe Thr
      65      70      75
Leu Gly Ser Phe Met Asn Asn Phe Met Thr Phe Pro Thr Gly Tyr
      80      85      90
Ile Phe Asp Arg Phe Lys Thr Thr Val Ala Arg Leu Ile Ala Ile
      95      100      105
Phe Phe Tyr Thr Thr Ala Thr Leu Ile Ile Ala Phe Thr Ser Ala
      110      115      120
Gly Ser Ala Val Leu Leu Phe Leu Ala Met Pro Met Leu Thr Ile
      125      130      135
Gly Gly Ile Leu Phe Leu Ile Thr Asn Leu Gln Ile Gly Asn Leu
      140      145      150
Phe Gly Gln His Arg Ser Thr Ile Ile Thr Leu Tyr Asn Gly Ala
      155      160      165
Phe Asp Ser Ser Ser Ala Val Phe Leu Ile Ile Lys Leu Leu Tyr
      170      175      180
Glu Lys Gly Ile Ser Leu Arg Ala Ser Phe Ile Phe Ile Ser Val
      185      190      195
Cys Ser Thr Trp His Val Ala Arg Thr Phe Leu Leu Met Pro Arg
      200      205      210
Gly His Ile Pro Tyr Pro Leu Pro Pro Asn Tyr Ser Tyr Gly Leu
      215      220      225
Cys Pro Gly Asn Gly Thr Thr Lys Glu Glu Lys Glu Thr Ala Glu
      230      235      240
His Glu Asn Arg Glu Leu Gln Ser Lys Glu Phe Leu Ser Ala Lys
      245      250      255
Glu Glu Thr Pro Gly Ala Gly Gln Lys Gln Glu Leu Arg Ser Phe

```


| | | |
|-------------------------------------|-------------------------|-----|
| 260 | 265 | 270 |
| Trp Ser Tyr Ala Phe Ser Arg Arg Phe | Ala Trp His Leu Val Trp | |
| 275 | 280 | 285 |
| Leu Ser Val Ile Gln Leu Trp His Tyr | Leu Phe Ile Gly Thr Leu | |
| 290 | 295 | 300 |
| Asn Ser Leu Leu Thr Asn Met Ala Gly | Gly Asp Met Ala Arg Val | |
| 305 | 310 | 315 |
| Ser Thr Tyr Thr Asn Ala Phe Ala Phe | Thr Gln Phe Gly Val Leu | |
| 320 | 325 | 330 |
| Cys Ala Pro Trp Asn Gly Leu Leu Met | Asp Arg Leu Lys Gln Lys | |
| 335 | 340 | 345 |
| Tyr Gln Lys Glu Ala Arg Lys Thr Gly | Ser Ser Thr Leu Ala Val | |
| 350 | 355 | 360 |
| Ala Leu Cys Ser Thr Val Pro Ser Leu | Ala Leu Thr Ser Leu Leu | |
| 365 | 370 | 375 |
| Cys Leu Gly Phe Ala Leu Cys Ala Ser | Val Pro Ile Leu Pro Leu | |
| 380 | 385 | 390 |
| Gln Tyr Leu Thr Phe Ile Leu Gln Val | Ile Ser Arg Ser Phe Leu | |
| 395 | 400 | 405 |
| Tyr Gly Ser Asn Ala Ala Phe Leu Thr | Leu Ala Phe Pro Ser Glu | |
| 410 | 415 | 420 |
| His Phe Gly Lys Leu Phe Gly Leu Val | Met Ala Leu Ser Ala Val | |
| 425 | 430 | 435 |
| Val Ser Leu Leu Gln Phe Pro Ile Phe | Thr Leu Ile Lys Gly Ser | |
| 440 | 445 | 450 |
| Leu Gln Asn Asp Pro Phe Tyr Val Asn | Val Met Phe Met Leu Ala | |
| 455 | 460 | 465 |
| Ile Leu Leu Thr Phe Phe His Pro Phe | Leu Val Tyr Arg Glu Cys | |
| 470 | 475 | 480 |
| Arg Thr Trp Lys Glu Ser Pro Ser Ala | Ile Ala | |
| 485 | 490 | |

<210> 13

<211> 580

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 977658CD1

<400> 13

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| Met Thr Ala Pro Ala Gly Pro Arg Gly Ser Glu Thr Glu Arg Leu | |
| 1 5 10 15 | |
| Leu Thr Pro Asn Pro Gly Tyr Gly Thr Gln Ala Gly Pro Ser Pro | |
| 20 25 30 | |
| Ala Pro Pro Thr Pro Pro Glu Glu Glu Asp Leu Arg Arg Arg Leu | |
| 35 40 45 | |
| Lys Tyr Phe Phe Met Ser Pro Cys Asp Lys Phe Arg Ala Lys Gly | |
| 50 55 60 | |
| Arg Lys Pro Cys Lys Leu Met Leu Gln Val Val Lys Ile Leu Val | |
| 65 70 75 | |
| Val Thr Val Gln Leu Ile Leu Phe Gly Leu Ser Asn Gln Leu Ala | |
| 80 85 90 | |
| Val Thr Phe Arg Glu Glu Asn Thr Ile Ala Phe Arg His Leu Phe | |
| 95 100 105 | |
| Leu Leu Gly Tyr Ser Asp Gly Ala Asp Asp Thr Phe Ala Ala Tyr | |
| 110 115 120 | |
| Thr Arg Glu Gln Leu Tyr Gln Ala Ile Phe His Ala Val Asp Gln | |
| 125 130 135 | |
| Tyr Leu Ala Leu Pro Asp Val Ser Leu Gly Arg Tyr Ala Tyr Val | |
| 140 145 150 | |
| Arg Gly Gly Gly Asp Pro Trp Thr Asn Gly Ser Gly Leu Ala Leu | |
| 155 160 165 | |

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<210> 14
<211> 455
<212> PRT
<213> Homo sapiens

<220>
<221> misc_feature
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<223> Incyte ID No: 1004703CD1

<400> 14

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Phe | Leu | Ile | Asp | Ser | Ser | Ile | Met | Ile | Thr | Ser | Gln | Ile |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |
| Leu | Phe | Phe | Gly | Phe | Gly | Trp | Leu | Phe | Phe | Met | Arg | Gln | Leu | Phe |
| | | | | 20 | | | | | 25 | | | | | 30 |
| Lys | Asp | Tyr | Glu | Ile | Arg | Gln | Tyr | Val | Val | Gln | Val | Ile | Phe | Ser |
| | | | | 35 | | | | | 40 | | | | | 45 |
| Val | Thr | Phe | Ala | Phe | Ser | Cys | Thr | Met | Phe | Glu | Leu | Ile | Ile | Phe |
| | | | | 50 | | | | | 55 | | | | | 60 |
| Glu | Ile | Leu | Gly | Val | Leu | Asn | Ser | Ser | Ser | Arg | Tyr | Phe | His | Trp |
| | | | | 65 | | | | | 70 | | | | | 75 |
| Lys | Met | Asn | Leu | Cys | Val | Ile | Leu | Leu | Ile | Leu | Val | Phe | Met | Val |
| | | | | 80 | | | | | 85 | | | | | 90 |
| Pro | Phe | Tyr | Ile | Gly | Tyr | Phe | Ile | Val | Ser | Asn | Ile | Arg | Leu | Leu |
| | | | | 95 | | | | | 100 | | | | | 105 |
| His | Lys | Gln | Arg | Leu | Leu | Phe | Ser | Cys | Leu | Leu | Trp | Leu | Thr | Phe |
| | | | | 110 | | | | | 115 | | | | | 120 |
| Met | Tyr | Phe | Phe | Trp | Lys | Leu | Gly | Asp | Leu | Phe | Pro | Ile | Leu | Ser |
| | | | | 125 | | | | | 130 | | | | | 135 |
| Pro | Lys | His | Gly | Ile | Leu | Ser | Ile | Glu | Gln | Leu | Ile | Ser | Arg | Val |
| | | | | 140 | | | | | 145 | | | | | 150 |
| Gly | Val | Ile | Gly | Val | Thr | Leu | Met | Ala | Leu | Leu | Ser | Gly | Phe | Gly |
| | | | | 155 | | | | | 160 | | | | | 165 |
| Ala | Val | Asn | Cys | Pro | Tyr | Thr | Tyr | Met | Ser | Tyr | Phe | Leu | Arg | Asn |
| | | | | 170 | | | | | 175 | | | | | 180 |
| Val | Thr | Asp | Thr | Asp | Ile | Leu | Ala | Leu | Glu | Arg | Arg | Leu | Leu | Gln |
| | | | | 185 | | | | | 190 | | | | | 195 |
| Thr | Met | Asp | Met | Ile | Ile | Ser | Lys | Lys | Lys | Arg | Met | Ala | Met | Ala |
| | | | | 200 | | | | | 205 | | | | | 210 |
| Arg | Arg | Thr | Met | Phe | Gln | Lys | Gly | Glu | Val | His | Asn | Lys | Pro | Ser |
| | | | | 215 | | | | | 220 | | | | | 225 |
| Gly | Phe | Trp | Gly | Met | Ile | Lys | Ser | Val | Thr | Thr | Ser | Ala | Ser | Gly |
| | | | | 230 | | | | | 235 | | | | | 240 |
| Ser | Glu | Asn | Leu | Thr | Leu | Ile | Gln | Gln | Glu | Val | Asp | Ala | Leu | Glu |
| | | | | 245 | | | | | 250 | | | | | 255 |
| Glu | Leu | Ser | Arg | Gln | Leu | Phe | Leu | Glu | Thr | Ala | Asp | Leu | Tyr | Ala |
| | | | | 260 | | | | | 265 | | | | | 270 |
| Thr | Lys | Glu | Arg | Ile | Glu | Tyr | Ser | Lys | Thr | Phe | Lys | Gly | Lys | Tyr |
| | | | | 275 | | | | | 280 | | | | | 285 |
| Phe | Asn | Phe | Leu | Gly | Tyr | Phe | Phe | Ser | Ile | Tyr | Cys | Val | Trp | Lys |
| | | | | 290 | | | | | 295 | | | | | 300 |
| Ile | Phe | Met | Ala | Thr | Ile | Asn | Ile | Val | Phe | Asp | Arg | Val | Gly | Lys |
| | | | | 305 | | | | | 310 | | | | | 315 |
| Thr | Asp | Pro | Val | Thr | Arg | Gly | Ile | Glu | Ile | Thr | Val | Asn | Tyr | Leu |
| | | | | 320 | | | | | 325 | | | | | 330 |
| Gly | Ile | Gln | Phe | Asp | Val | Lys | Phe | Trp | Ser | Gln | His | Ile | Ser | Phe |
| | | | | 335 | | | | | 340 | | | | | 345 |
| Ile | Leu | Val | Gly | Ile | Ile | Ile | Val | Thr | Ser | Ile | Arg | Gly | Leu | Leu |
| | | | | 350 | | | | | 355 | | | | | 360 |
| Ile | Thr | Leu | Thr | Lys | Phe | Phe | Tyr | Ala | Ile | Ser | Ser | Ser | Lys | Ser |
| | | | | 365 | | | | | 370 | | | | | 375 |
| Ser | Asn | Val | Ile | Val | Leu | Leu | Leu | Ala | Gln | Ile | Met | Gly | Met | Tyr |
| | | | | 380 | | | | | 385 | | | | | 390 |
| Phe | Val | Ser | Ser | Val | Leu | Leu | Ile | Arg | Met | Ser | Met | Pro | Leu | Glu |
| | | | | 395 | | | | | 400 | | | | | 405 |
| Tyr | Arg | Thr | Ile | Ile | Thr | Glu | Val | Leu | Gly | Glu | Leu | Gln | Phe | Asn |
| | | | | 410 | | | | | 415 | | | | | 420 |
| Phe | Tyr | His | Arg | Trp | Phe | Asp | Val | Ile | Phe | Leu | Val | Ser | Ala | Leu |
| | | | | 425 | | | | | 430 | | | | | 435 |
| Ser | Ser | Ile | Leu | Phe | Leu | Tyr | Leu | Ala | His | Lys | Gln | Ala | Pro | Glu |
| | | | | 440 | | | | | 445 | | | | | 450 |

Lys Gln Met Ala Pro
455

<210> 15

<211> 277

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1334051CD1

<400> 15

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Met Lys Ile Ser Met Ile Asn Tyr Lys Ser Leu Leu Ala Leu Leu
 1          5          10          15
Phe Ile Leu Ala Ser Trp Ile Ile Phe Thr Val Phe Gln Asn Ser
          20          25          30
Thr Lys Val Trp Ser Ala Leu Asn Leu Ser Ile Ser Leu His Tyr
          35          40          45
Trp Asn Asn Ser Thr Lys Ser Leu Phe Pro Lys Thr Pro Leu Ile
          50          55          60
Ser Leu Lys Pro Leu Thr Glu Thr Glu Leu Arg Ile Lys Glu Ile
          65          70          75
Ile Glu Lys Leu Asp Gln Gln Ile Pro Pro Arg Pro Phe Thr His
          80          85          90
Val Asn Thr Thr Thr Ser Ala Thr His Ser Thr Ala Thr Ile Leu
          95          100          105
Asn Pro Arg Asp Thr Tyr Cys Arg Gly Asp Gln Leu His Ile Leu
          110          115          120
Leu Glu Val Arg Asp His Leu Gly Arg Arg Lys Gln Tyr Gly Gly
          125          130          135
Asp Phe Leu Arg Ala Arg Met Ser Ser Pro Ala Leu Met Ala Gly
          140          145          150
Ala Ser Gly Lys Val Thr Asp Phe Asn Asn Gly Thr Tyr Leu Val
          155          160          165
Ser Phe Thr Leu Phe Trp Glu Gly Gln Val Ser Leu Ser Leu Leu
          170          175          180
Leu Ile His Pro Ser Glu Gly Val Ser Ala Leu Trp Ser Ala Arg
          185          190          195
Asn Gln Gly Tyr Asp Arg Val Ile Phe Thr Gly Gln Phe Val Asn
          200          205          210
Gly Thr Ser Gln Val His Ser Glu Cys Gly Leu Ile Leu Asn Thr
          215          220          225
Asn Ala Glu Leu Cys Gln Tyr Leu Asp Asn Arg Asp Gln Glu Gly
          230          235          240
Phe Tyr Cys Val Arg Pro Gln His Met Pro Cys Ala Ala Leu Thr
          245          250          255
His Met Tyr Ser Lys Asn Lys Lys Val Ser Tyr Leu Ser Lys Gln
          260          265          270
Glu Lys Ser Leu Phe Glu Arg
          275

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<210> 16

<211> 647

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1336728CD1

<400> 16

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Met Ala Ser Leu Val Ser Leu Glu Leu Gly Leu Leu Leu Ala Val
 1          5          10          15
Leu Val Val Thr Ala Thr Ala Ser Pro Pro Ala Gly Leu Leu Ser

```

| | | | |
|--|-----|-----|-----|
| | 20 | 25 | 30 |
| Leu Leu Thr Ser Gly Gln Gly Ala Leu Asp Gln Glu Ala Leu Gly | | | |
| | 35 | 40 | 45 |
| Gly Leu Leu Asn Thr Leu Ala Asp Arg Val His Cys Thr Asn Gly | | | |
| | 50 | 55 | 60 |
| Pro Cys Gly Lys Cys Leu Ser Val Glu Asp Ala Leu Gly Leu Gly | | | |
| | 65 | 70 | 75 |
| Glu Pro Glu Gly Ser Gly Leu Pro Pro Gly Pro Val Leu Glu Ala | | | |
| | 80 | 85 | 90 |
| Arg Tyr Val Ala Arg Leu Ser Ala Ala Ala Val Leu Tyr Leu Ser | | | |
| | 95 | 100 | 105 |
| Asn Pro Glu Gly Thr Cys Glu Asp Thr Arg Ala Gly Leu Trp Ala | | | |
| | 110 | 115 | 120 |
| Ser His Ala Asp His Leu Leu Ala Leu Leu Glu Ser Pro Lys Ala | | | |
| | 125 | 130 | 135 |
| Leu Thr Pro Gly Leu Ser Trp Leu Leu Gln Arg Met Gln Ala Arg | | | |
| | 140 | 145 | 150 |
| Ala Ala Gly Gln Thr Pro Lys Thr Ala Cys Val Asp Ile Pro Gln | | | |
| | 155 | 160 | 165 |
| Leu Leu Glu Glu Ala Val Gly Ala Gly Ala Pro Gly Ser Ala Gly | | | |
| | 170 | 175 | 180 |
| Gly Val Leu Ala Ala Leu Leu Asp His Val Arg Ser Gly Ser Cys | | | |
| | 185 | 190 | 195 |
| Phe His Ala Leu Pro Ser Pro Gln Tyr Phe Val Asp Phe Val Phe | | | |
| | 200 | 205 | 210 |
| Gln Gln His Ser Ser Glu Val Pro Met Thr Leu Ala Glu Leu Ser | | | |
| | 215 | 220 | 225 |
| Ala Leu Met Gln Arg Leu Gly Val Gly Arg Glu Ala His Ser Asp | | | |
| | 230 | 235 | 240 |
| His Ser His Arg His Arg Gly Ala Ser Ser Arg Asp Pro Val Pro | | | |
| | 245 | 250 | 255 |
| Leu Ile Ser Ser Ser Asn Ser Ser Ser Val Trp Asp Thr Val Cys | | | |
| | 260 | 265 | 270 |
| Leu Ser Ala Arg Asp Val Met Ala Ala Tyr Gly Leu Ser Glu Gln | | | |
| | 275 | 280 | 285 |
| Ala Gly Val Thr Pro Glu Ala Trp Ala Gln Leu Ser Pro Ala Leu | | | |
| | 290 | 295 | 300 |
| Leu Gln Gln Gln Leu Ser Gly Ala Cys Thr Ser Gln Ser Arg Pro | | | |
| | 305 | 310 | 315 |
| Pro Val Gln Asp Gln Leu Ser Gln Ser Glu Arg Tyr Leu Tyr Gly | | | |
| | 320 | 325 | 330 |
| Ser Leu Ala Thr Leu Leu Ile Cys Leu Cys Ala Val Phe Gly Leu | | | |
| | 335 | 340 | 345 |
| Leu Leu Leu Thr Cys Thr Gly Cys Arg Gly Val Thr His Tyr Ile. | | | |
| | 350 | 355 | 360 |
| Leu Gln Thr Phe Leu Ser Leu Ala Val Gly Ala Leu Thr Gly Asp | | | |
| | 365 | 370 | 375 |
| Ala Val Leu His Leu Thr Pro Lys Val Leu Gly Leu His Thr His | | | |
| | 380 | 385 | 390 |
| Ser Glu Glu Gly Leu Ser Pro Gln Pro Thr Trp Arg Leu Leu Ala | | | |
| | 395 | 400 | 405 |
| Met Leu Ala Gly Leu Tyr Ala Phe Phe Leu Phe Glu Asn Leu Phe | | | |
| | 410 | 415 | 420 |
| Asn Leu Leu Leu Pro Arg Asp Pro Glu Asp Leu Glu Asp Gly Pro | | | |
| | 425 | 430 | 435 |
| Cys Gly His Ser Ser His Ser His Gly Gly His Ser His Gly Val | | | |
| | 440 | 445 | 450 |
| Ser Leu Gln Leu Ala Pro Ser Glu Leu Arg Gln Pro Lys Pro Pro | | | |
| | 455 | 460 | 465 |
| His Glu Gly Ser Arg Ala Asp Leu Val Ala Glu Glu Ser Pro Glu | | | |
| | 470 | 475 | 480 |
| Leu Leu Asn Pro Glu Pro Arg Arg Leu Ser Pro Glu Leu Arg Leu | | | |
| | 485 | 490 | 495 |

```

Leu Pro Tyr Met Ile Thr Leu Gly Asp Ala Val His Asn Phe Ala
500 505 510
Asp Gly Leu Ala Val Gly Ala Ala Phe Ala Ser Ser Trp Lys Thr
515 520 525
Gly Leu Ala Thr Ser Leu Ala Val Phe Cys His Glu Leu Pro His
530 535 540
Glu Leu Gly Asp Phe Ala Ala Leu Leu His Ala Gly Leu Ser Val
545 550 555
Arg Gln Ala Leu Leu Leu Asn Leu Ala Ser Ala Leu Thr Ala Phe
560 565 570
Ala Gly Leu Tyr Val Ala Leu Ala Val Gly Val Ser Glu Glu Ser
575 580 585
Glu Ala Trp Ile Leu Ala Val Ala Thr Gly Leu Phe Leu Tyr Val
590 595 600
Ala Leu Cys Asp Met Leu Pro Ala Met Leu Lys Val Arg Asp Pro
605 610 615
Arg Pro Trp Leu Leu Phe Leu Leu His Asn Val Gly Leu Leu Gly
620 625 630
Gly Trp Thr Val Leu Leu Leu Leu Ser Leu Tyr Glu Asp Asp Ile
635 640 645
Thr Phe

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<210> 17

<211> 406

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1452856CD1

<400> 17

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Asn Lys Glu His His Asn Gly Asn Phe Thr Asp Pro Ser Ser Val
20 25 30
Asn Glu Lys Lys Arg Arg Glu Arg Glu Arg Gln Asn Ile Val
35 40 45
Leu Trp Arg Gln Pro Leu Ile Thr Leu Gln Tyr Phe Ser Leu Glu
50 55 60
Ile Leu Val Ile Leu Lys Glu Trp Thr Ser Lys Leu Trp His Arg
65 70 75
Gln Ser Ile Val Val Ser Phe Leu Leu Leu Leu Ala Val Leu Ile
80 85 90
Ala Thr Tyr Tyr Val Glu Gly Val His Gln Gln Tyr Val Gln Arg
95 100 105
Ile Glu Lys Gln Phe Leu Leu Tyr Ala Tyr Trp Ile Gly Leu Gly
110 115 120
Ile Leu Ser Ser Val Gly Leu Gly Thr Gly Leu His Thr Phe Leu
125 130 135
Leu Tyr Leu Gly Pro His Ile Ala Ser Val Thr Leu Ala Ala Tyr
140 145 150
Glu Cys Asn Ser Val Asn Phe Pro Glu Pro Pro Tyr Pro Asp Gln
155 160 165
Ile Ile Cys Pro Asp Glu Glu Gly Thr Glu Gly Thr Ile Ser Leu
170 175 180
Trp Ser Ile Ile Ser Lys Val Arg Ile Glu Ala Cys Met Trp Gly
185 190 195
Ile Gly Thr Ala Ile Gly Glu Leu Pro Pro Tyr Phe Met Ala Arg
200 205 210
Ala Ala Arg Leu Ser Gly Ala Glu Pro Asp Asp Glu Glu Tyr Gln
215 220 225
Glu Phe Glu Glu Met Leu Glu His Ala Glu Ser Ala Gln Asp Phe

```

| | | | | | |
|-----------------|---------------------|---------------------|-----|--|-----|
| | 230 | | 235 | | 240 |
| Ala Ser Arg Ala | Lys Leu Ala Val Gln | Lys Leu Val Gln Lys | Val | | |
| | 245 | | 250 | | 255 |
| Gly Phe Phe Gly | Ile Leu Ala Cys Ala | Ser Ile Pro Asn Pro | Leu | | |
| | 260 | | 265 | | 270 |
| Phe Asp Leu Ala | Gly Ile Thr Cys Gly | His Phe Leu Val Pro | Phe | | |
| | 275 | | 280 | | 285 |
| Trp Thr Phe Phe | Gly Ala Thr Leu Ile | Gly Lys Ala Ile Ile | Lys | | |
| | 290 | | 295 | | 300 |
| Met His Ile Gln | Lys Ile Phe Val Ile | Ile Thr Phe Ser Lys | His | | |
| | 305 | | 310 | | 315 |
| Ile Val Glu Gln | Met Val Ala Phe Ile | Gly Ala Val Pro Gly | Ile | | |
| | 320 | | 325 | | 330 |
| Gly Pro Ser Leu | Gln Lys Pro Phe Gln | Glu Tyr Leu Glu Ala | Gln | | |
| | 335 | | 340 | | 345 |
| Arg Gln Lys Leu | His His Lys Ser Glu | Met Gly Thr Pro Gln | Gly | | |
| | 350 | | 355 | | 360 |
| Glu Asn Trp Leu | Ser Trp Met Phe Glu | Lys Leu Val Val Val | Met | | |
| | 365 | | 370 | | 375 |
| Val Cys Tyr Phe | Ile Leu Ser Ile Ile | Asn Ser Met Ala Gln | Ser | | |
| | 380 | | 385 | | 390 |
| Tyr Ala Lys Arg | Ile Gln Gln Arg Leu | Asn Ser Glu Glu Lys | Thr | | |
| | 395 | | 400 | | 405 |
| Lys | | | | | |

<210> 18

<211> 290

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1562471CD1

<400> 18

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| 1 | 5 | 10 | 15 |
| Tyr Ser Ile Ala Thr | Gln Ile Thr Gly | Pro Thr Thr Val Asn | Gly |
| | 20 | 25 | 30 |
| Leu Glu Arg Gly Ser | Leu Thr Val Gln | Cys Val Tyr Arg Ser | Gly |
| | 35 | 40 | 45 |
| Trp Glu Thr Tyr Leu | Lys Trp Trp Cys | Arg Gly Ala Ile Trp | Arg |
| | 50 | 55 | 60 |
| Asp Cys Lys Ile Leu | Val Lys Thr Ser | Gly Ser Glu Gln Glu | Val |
| | 65 | 70 | 75 |
| Lys Arg Asp Arg Val | Ser Ile Lys Asp | Asn Gln Lys Asn Arg | Thr |
| | 80 | 85 | 90 |
| Phe Thr Val Thr Met | Glu Asp Leu Met | Lys Thr Asp Ala Asp | Thr |
| | 95 | 100 | 105 |
| Tyr Trp Cys Gly Ile | Glu Lys Thr Gly | Asn Asp Leu Gly Val | Thr |
| | 110 | 115 | 120 |
| Val Gln Val Thr Ile | Asp Pro Ala Pro | Val Thr Gln Glu Glu | Thr |
| | 125 | 130 | 135 |
| Ser Ser Ser Pro Thr | Leu Thr Gly His | His Leu Asp Asn Arg | His |
| | 140 | 145 | 150 |
| Lys Leu Leu Lys Leu | Ser Val Leu Leu | Pro Leu Ile Phe Thr | Ile |
| | 155 | 160 | 165 |
| Leu Leu Leu Leu Leu | Val Ala Ala Ser | Leu Leu Ala Trp Arg | Met |
| | 170 | 175 | 180 |
| Met Lys Tyr Gln Gln | Lys Ala Ala Gly | Met Ser Pro Glu Gln | Val |
| | 185 | 190 | 195 |
| Leu Gln Pro Leu Glu | Gly Asp Leu Cys | Tyr Ala Asp Leu Thr | Leu |
| | 200 | 205 | 210 |

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Leu | Ala | Gly | Thr | Ser | Pro | Arg | Lys | Ala | Thr | Thr | Lys | Leu | Ser |
| | | | | 215 | | | | | 220 | | | | | 225 |
| Ser | Ala | Gln | Val | Asp | Gln | Val | Glu | Val | Glu | Tyr | Val | Thr | Met | Ala |
| | | | | 230 | | | | | 235 | | | | | 240 |
| Ser | Leu | Pro | Lys | Glu | Asp | Ile | Ser | Tyr | Ala | Ser | Leu | Thr | Leu | Gly |
| | | | | 245 | | | | | 250 | | | | | 255 |
| Ala | Glu | Asp | Gln | Glu | Pro | Thr | Tyr | Cys | Asn | Met | Gly | His | Leu | Ser |
| | | | | 260 | | | | | 265 | | | | | 270 |
| Ser | His | Leu | Pro | Gly | Arg | Gly | Pro | Glu | Glu | Pro | Thr | Glu | Tyr | Ser |
| | | | | 275 | | | | | 280 | | | | | 285 |
| Thr | Ile | Ser | Arg | Pro | | | | | | | | | | |
| | | | | 290 | | | | | | | | | | |

<210> 19

<211> 390

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1618158CD1

<400> 19

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| Met | Phe | Ser | Thr | Asn | Tyr | Ser | His | Met | Glu | Asn | Tyr | Arg | Lys | Arg |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |
| Glu | Asp | Leu | Val | Tyr | Gln | Ser | Thr | Val | Arg | Leu | Pro | Glu | Val | Arg |
| | | | | 20 | | | | | 25 | | | | | 30 |
| Ile | Ser | Asp | Asn | Gly | Pro | Tyr | Glu | Cys | His | Val | Gly | Ile | Tyr | Asp |
| | | | | 35 | | | | | 40 | | | | | 45 |
| Arg | Ala | Thr | Arg | Glu | Lys | Val | Val | Leu | Ala | Ser | Gly | Asn | Ile | Phe |
| | | | | 50 | | | | | 55 | | | | | 60 |
| Leu | Asn | Val | Met | Ala | Pro | Pro | Thr | Ser | Ile | Glu | Val | Val | Ala | Ala |
| | | | | 65 | | | | | 70 | | | | | 75 |
| Asp | Thr | Pro | Ala | Pro | Phe | Ser | Arg | Tyr | Gln | Ala | Gln | Asn | Phe | Thr |
| | | | | 80 | | | | | 85 | | | | | 90 |
| Leu | Val | Cys | Ile | Val | Ser | Gly | Gly | Lys | Pro | Ala | Pro | Met | Val | Tyr |
| | | | | 95 | | | | | 100 | | | | | 105 |
| Phe | Lys | Arg | Asp | Gly | Glu | Pro | Ile | Asp | Ala | Val | Pro | Leu | Ser | Glu |
| | | | | 110 | | | | | 115 | | | | | 120 |
| Pro | Pro | Ala | Ala | Ser | Ser | Gly | Pro | Leu | Gln | Asp | Ser | Arg | Pro | Phe |
| | | | | 125 | | | | | 130 | | | | | 135 |
| Arg | Ser | Leu | Leu | His | Arg | Asp | Leu | Asp | Asp | Thr | Lys | Met | Gln | Lys |
| | | | | 140 | | | | | 145 | | | | | 150 |
| Ser | Leu | Ser | Leu | Leu | Asp | Ala | Glu | Asn | Arg | Gly | Gly | Arg | Pro | Tyr |
| | | | | 155 | | | | | 160 | | | | | 165 |
| Thr | Glu | Arg | Pro | Ser | Arg | Gly | Leu | Thr | Pro | Asp | Pro | Asn | Ile | Leu |
| | | | | 170 | | | | | 175 | | | | | 180 |
| Leu | Gln | Pro | Thr | Thr | Glu | Asn | Ile | Pro | Glu | Thr | Val | Val | Ser | Arg |
| | | | | 185 | | | | | 190 | | | | | 195 |
| Glu | Phe | Pro | Arg | Trp | Val | His | Ser | Ala | Glu | Pro | Thr | Tyr | Phe | Leu |
| | | | | 200 | | | | | 205 | | | | | 210 |
| Arg | His | Ser | Arg | Thr | Pro | Ser | Ser | Asp | Gly | Thr | Val | Glu | Val | Arg |
| | | | | 215 | | | | | 220 | | | | | 225 |
| Ala | Leu | Leu | Thr | Trp | Thr | Leu | Asn | Pro | Gln | Ile | Asp | Asn | Glu | Ala |
| | | | | 230 | | | | | 235 | | | | | 240 |
| Leu | Phe | Ser | Cys | Glu | Val | Lys | His | Pro | Ala | Leu | Ser | Met | Pro | Met |
| | | | | 245 | | | | | 250 | | | | | 255 |
| Gln | Ala | Glu | Val | Thr | Leu | Val | Ala | Pro | Lys | Gly | Pro | Lys | Ile | Val |
| | | | | 260 | | | | | 265 | | | | | 270 |
| Met | Thr | Pro | Ser | Arg | Ala | Arg | Val | Gly | Asp | Thr | Val | Arg | Ile | Leu |
| | | | | 275 | | | | | 280 | | | | | 285 |
| Val | His | Gly | Phe | Gln | Asn | Glu | Val | Phe | Pro | Glu | Pro | Met | Phe | Thr |
| | | | | 290 | | | | | 295 | | | | | 300 |
| Trp | Thr | Arg | Val | Gly | Ser | Arg | Leu | Leu | Asp | Gly | Ser | Ala | Glu | Phe |

| | | | | | |
|-----------------|-----|---------------------|-----|-------------------------|-----|
| Asp Gly Lys Glu | 305 | Val Leu Glu Arg | 310 | Val Pro Ala Glu Leu Asn | 315 |
| | 320 | | 325 | | 330 |
| Gly Ser Met Tyr | 335 | Arg Cys Thr Ala Gln | 340 | Pro Leu Gly Ser Thr | 345 |
| Asp Thr His Thr | 350 | Arg Leu Ile Val Phe | 355 | Glu Asn Pro Asn Ile Pro | 360 |
| Arg Gly Thr Glu | 365 | Asp Ser Asn Gly Ser | 370 | Ile Gly Pro Thr Gly Ala | 375 |
| Arg Leu Thr Leu | 380 | Val Leu Ala Leu Thr | 385 | Val Ile Leu Glu Leu Thr | 390 |

<210> 20

<211> 427

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1656935CD1

<400> 20

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|---|-----|-----|-----|-----|
| Met Asn Val Asn Ser Met Asp Met Thr Gly Gly Leu Ser Val Lys | 1 | 5 | 10 | 15 |
| Asp Pro Ser Gln Ser Gln Ser Arg Leu Pro Gln Trp Thr His Pro | 20 | 25 | 30 | 35 |
| Asn Ser Met Asp Asn Leu Pro Ser Ala Ala Ser Pro Leu Glu Gln | 40 | 45 | 50 | 55 |
| Asn Pro Ser Lys His Gly Ala Ile Pro Gly Gly Leu Ser Ile Gly | 60 | 65 | 70 | 75 |
| Pro Pro Gly Lys Ser Ser Ile Asp Asp Ser Tyr Gly Arg Tyr Asp | 80 | 85 | 90 | 95 |
| Leu Ile Gln Asn Ser Glu Ser Pro Ala Ser Pro Pro Val Ala Val | 100 | 105 | 110 | 115 |
| Pro His Ser Trp Ser Arg Ala Lys Ser Asp Ser Asp Lys Ile Ser | 120 | 125 | 130 | 135 |
| Asn Gly Ser Ser Ile Asn Trp Pro Pro Glu Phe His Pro Gly Val | 140 | 145 | 150 | 155 |
| Pro Trp Lys Gly Leu Gln Asn Ile Asp Pro Glu Asn Asp Pro Asp | 160 | 165 | 170 | 175 |
| Val Thr Pro Gly Ser Val Pro Thr Gly Pro Thr Ile Asn Thr Thr | 180 | 185 | 190 | 195 |
| Ile Gln Asp Val Asn Arg Tyr Leu Leu Lys Ser Gly Gly Ser Ser | 200 | 205 | 210 | 215 |
| Pro Pro Ser Ser Gln Asn Ala Thr Leu Pro Ser Ser Ser Ala Trp | 220 | 225 | 230 | 235 |
| Pro Leu Ser Ala Ser Gly Tyr Ser Ser Phe Ser Ser Ile Ala | 240 | 245 | 250 | 255 |
| Ser Ala Pro Ser Val Ala Gly Lys Leu Ser Asp Ile Lys Ser Thr | 260 | 265 | 270 | 275 |
| Trp Ser Ser Gly Pro Thr Ser His Thr Gln Ala Ser Leu Ser His | 280 | 285 | 290 | 295 |
| Glu Leu Trp Lys Val Pro Arg Asn Ser Thr Ala Pro Thr Arg Pro | 300 | 305 | 310 | 315 |
| Pro Pro Gly Leu Thr Asn Pro Lys Pro Ser Ser Thr Trp Gly Ala | 320 | 325 | 330 | 335 |
| Ser Pro Leu Gly Trp Thr Ser Ser Tyr Ser Ser Gly Ser Ala Trp | 340 | 345 | 350 | 355 |
| Ser Thr Asp Thr Ser Gly Arg Thr Ser Ser Trp Leu Val Leu Arg | 360 | 365 | 370 | 375 |
| Asn Leu Thr Pro Gln Ile Asp Gly Ser Lys Leu Arg Thr Leu Cys | 380 | 385 | 390 | 395 |
| Leu Gln His Gly Pro Leu Ile Thr Phe His Leu Asn Leu Thr Gln | 400 | 405 | 410 | 415 |

| | | | | | |
|-----------------|---------------------|---------------------|-----|--|-----|
| | 305 | | 310 | | 315 |
| Gly Asn Ala Val | Val Arg Tyr Ser Ser | Lys Glu Glu Gly Leu | Pro | | |
| | 320 | | 325 | | 330 |
| Lys Ala Gln Glu | Val Leu Cys Thr Ile | Val Arg Pro Trp Glu | Thr | | |
| | 335 | | 340 | | 345 |
| Leu Ser His Ser | Leu Gly Pro Ser Phe | Arg Leu Val Gly Thr | Lys | | |
| | 350 | | 355 | | 360 |
| Glu Val Gly Ile | Arg Val Ser Phe Lys | Pro Pro Glu Gly Pro | Gly | | |
| | 365 | | 370 | | 375 |
| Arg Ile Gly Gln | Ser Thr Ile Phe Gln | Gly Leu Ala Gln Phe | His | | |
| | 380 | | 385 | | 390 |
| Asp Gln Arg Gly | Val Ser Lys Leu Thr | Gly Arg Gly Gly Ile | His | | |
| | 395 | | 400 | | 405 |
| Arg Pro Arg Gly | Arg Gly Lys Ala Ser | His Gln Leu Ala His | Met | | |
| | 410 | | 415 | | 420 |
| Arg His Cys Glu | Leu Thr Phe | | | | |
| | 425 | | | | |

<210> 21

<211> 459

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1859305CD1

<400> 21

| | | |
|---------------------|---------------------|---------------------|
| Met Glu Lys Thr Cys | Ile Asp Ala Leu Pro | Leu Thr Met Asn Ser |
| 1 | 5 | 10 |
| Ser Glu Lys Gln Glu | Thr Val Cys Ile Phe | Gly Thr Gly Asp Phe |
| | 20 | 25 |
| Gly Arg Ser Leu Gly | Leu Lys Met Leu Gln | Cys Gly Tyr Ser Val |
| | 35 | 40 |
| Val Phe Gly Ser Arg | Asn Pro Gln Lys Thr | Thr Leu Leu Pro Ser |
| | 50 | 55 |
| Gly Ala Glu Val Leu | Ser Tyr Ser Glu Ala | Ala Lys Lys Ser Asp |
| | 65 | 70 |
| Ile Ile Ile Ile Ala | Ile His Arg Glu His | Tyr Asp Phe Leu Thr |
| | 80 | 85 |
| Glu Leu Thr Glu Val | Leu Asn Gly Lys Ile | Leu Val Asp Ile Ser |
| | 95 | 100 |
| Asn Asn Leu Lys Ile | Asn Gln Tyr Pro Glu | Ser Asn Ala Glu Tyr |
| | 110 | 115 |
| Leu Ala His Leu Val | Pro Gly Ala His Val | Val Lys Ala Phe Asn |
| | 125 | 130 |
| Thr Ile Ser Ala Trp | Ala Leu Gln Ser Gly | Ala Leu Asp Ala Ser |
| | 140 | 145 |
| Arg Gln Val Phe Val | Cys Gly Asn Asp Ser | Lys Ala Lys Gln Arg |
| | 155 | 160 |
| Val Met Asp Ile Val | Arg Asn Leu Gly Leu | Thr Pro Met Asp Gln |
| | 170 | 175 |
| Gly Ser Leu Met Ala | Ala Lys Glu Ile Glu | Lys Tyr Pro Leu Gln |
| | 185 | 190 |
| Leu Phe Pro Met Trp | Arg Phe Pro Phe Tyr | Leu Ser Ala Val Leu |
| | 200 | 205 |
| Cys Val Phe Leu Phe | Phe Tyr Cys Val Ile | Arg Asp Val Ile Tyr |
| | 215 | 220 |
| Pro Tyr Val Tyr Glu | Lys Lys Asp Asn Thr | Phe Arg Met Ala Ile |
| | 230 | 235 |
| Ser Ile Pro Asn Arg | Ile Phe Pro Ile Thr | Ala Leu Thr Leu Leu |
| | 245 | 250 |
| Ala Leu Val Tyr Leu | Pro Gly Val Ile Ala | Ala Ile Leu Gln Leu |
| | 260 | 265 |

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Tyr Arg Gly Thr Lys Tyr Arg Arg Phe Pro Asp Trp Leu Asp His
275 280 285
Trp Met Leu Cys Arg Lys Gln Leu Gly Leu Val Ala Leu Gly Phe
290 295 300
Ala Phe Leu His Val Leu Tyr Thr Leu Val Ile Pro Ile Arg Tyr
305 310 315
Tyr Val Arg Trp Arg Leu Gly Asn Leu Thr Val Thr Gln Ala Ile
320 325 330
Leu Lys Lys Glu Asn Pro Phe Ser Thr Ser Ser Ala Trp Leu Ser
335 340 345
Asp Ser Tyr Val Ala Leu Gly Ile Leu Gly Phe Phe Leu Phe Val
350 355 360
Leu Leu Gly Ile Thr Ser Leu Pro Ser Val Ser Asn Ala Val Asn
365 370 375
Trp Arg Glu Phe Arg Phe Val Gln Ser Lys Leu Gly Tyr Leu Thr
380 385 390
Leu Ile Leu Cys Thr Ala His Thr Leu Val Tyr Gly Gly Lys Arg
395 400 405
Phe Leu Ser Pro Ser Asn Leu Arg Trp Tyr Leu Pro Ala Ala Tyr
410 415 420
Val Leu Gly Leu Ile Ile Pro Cys Thr Val Leu Val Ile Lys Phe
425 430 435
Val Leu Ile Met Pro Cys Val Asp Asn Thr Leu Thr Arg Ile Arg
440 445 450
Gln Gly Trp Glu Arg Asn Ser Lys His
455

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<210> 22

<211> 229

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1949083CD1

<400> 22

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Met Leu Pro Val Ser Arg Thr Cys Leu Leu Glu Ser Ser Thr Arg
1 5 10 15
Leu Lys Pro His Glu Ala Gln Asn Tyr Arg Lys Lys Ala Leu Trp
20 25 30
Val Ser Trp Phe Ser Ile Ile Val Thr Leu Ala Leu Ala Val Ala
35 40 45
Ala Phe Thr Val Ser Val Met Arg Tyr Ser Ala Ser Ala Phe Gly
50 55 60
Phe Ala Phe Asp Ala Ile Leu Asp Val Leu Ser Ser Ala Ile Val
65 70 75
Leu Trp Arg Tyr Ser Asn Ala Ala Ala Val His Ser Ala His Arg
80 85 90
Glu Tyr Ile Ala Cys Val Ile Leu Gly Val Ile Phe Leu Leu Ser
95 100 105
Ser Ile Cys Ile Val Val Lys Ala Ile His Asp Leu Ser Thr Arg
110 115 120
Leu Leu Pro Glu Val Asp Asp Phe Leu Phe Ser Val Ser Ile Leu
125 130 135
Ser Gly Ile Leu Cys Ser Ile Leu Ala Val Leu Lys Phe Met Leu
140 145 150
Gly Lys Val Leu Thr Ser Arg Ala Leu Ile Thr Asp Gly Phe Asn
155 160 165
Ser Leu Val Gly Gly Val Met Gly Phe Ser Ile Leu Leu Ser Ala
170 175 180
Glu Val Phe Lys His Asp Ser Ala Val Trp Tyr Leu Asp Gly Ser
185 190 195
Ile Gly Val Leu Ile Gly Leu Thr Ile Phe Ala Tyr Gly Val Lys

```

| | | | | | |
|---|-----|--|-----|--|-----|
| | 200 | | 205 | | 210 |
| Leu Leu Ile Asp Met Val Pro Lys Val Arg Gln Thr Arg His Tyr | | | | | |
| | 215 | | 220 | | 225 |
| Glu Met Phe Glu | | | | | |

<210> 23
 <211> 311
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 1996357CD1

<400> 23
 Met Ala Val Asp Ile Gln Pro Ala Cys Leu Gly Leu Tyr Cys Gly
 1 5 10 15
 Lys Thr Leu Leu Phe Lys Asn Gly Ser Thr Glu Ile Tyr Gly Glu
 20 25 30
 Cys Gly Val Cys Pro Arg Gly Gln Arg Thr Asn Ala Gln Lys Tyr
 35 40 45
 Cys Gln Pro Cys Thr Glu Ser Pro Glu Leu Tyr Asp Trp Leu Tyr
 50 55 60
 Leu Gly Phe Met Ala Met Leu Pro Leu Val Leu His Trp Phe Phe
 65 70 75
 Ile Glu Trp Tyr Ser Gly Lys Lys Ser Ser Ser Ala Leu Phe Gln
 80 85 90
 His Ile Thr Ala Leu Phe Glu Cys Ser Met Ala Ala Ile Ile Thr
 95 100 105
 Leu Leu Val Ser Asp Pro Val Gly Val Leu Tyr Ile Arg Ser Cys
 110 115 120
 Arg Val Leu Met Leu Ser Asp Trp Tyr Thr Met Leu Tyr Asn Pro
 125 130 135
 Ser Pro Asp Tyr Val Thr Thr Val His Cys Thr His Glu Ala Val
 140 145 150
 Tyr Pro Leu Tyr Thr Ile Val Phe Ile Tyr Tyr Ala Phe Cys Leu
 155 160 165
 Val Leu Met Met Leu Leu Arg Pro Leu Leu Val Lys Lys Ile Ala
 170 175 180
 Cys Gly Leu Gly Lys Ser Asp Arg Phe Lys Ser Ile Tyr Ala Ala
 185 190 195
 Leu Tyr Phe Phe Pro Ile Leu Thr Val Leu Gln Ala Val Gly Gly
 200 205 210
 Gly Leu Leu Tyr Tyr Ala Phe Pro Tyr Ile Ile Leu Val Leu Ser
 215 220 225
 Leu Val Thr Leu Ala Val Tyr Met Ser Ala Ser Glu Ile Glu Asn
 230 235 240
 Cys Tyr Asp Leu Leu Val Arg Lys Lys Arg Leu Ile Val Leu Phe
 245 250 255
 Ser His Trp Leu Leu His Ala Tyr Gly Ile Ile Ser Ile Ser Arg
 260 265 270
 Val Asp Lys Leu Glu Gln Asp Leu Pro Leu Leu Ala Leu Val Pro
 275 280 285
 Thr Pro Ala Leu Phe Tyr Leu Phe Thr Ala Lys Phe Thr Glu Pro
 290 295 300
 Ser Arg Ile Leu Ser Glu Gly Ala Asn Gly His
 305 310

<210> 24
 <211> 92
 <212> PRT
 <213> Homo sapiens

<220>

<221> misc_feature
 <223> Incyte ID No: 2061330CD1

<400> 24
 Met Arg Phe Ile Phe Leu Lys Phe Trp Thr Tyr Thr Val Arg Ala
 1 5 10 15
 Ser Thr Asp Leu Thr Gln Thr Gly Asp Cys Ser Gln Cys Thr His
 20 25 30
 Gln Val Thr Glu Val Gly Gln Gln Ile Lys Thr Ile Phe Leu Phe
 35 40 45
 Tyr Ser Tyr Tyr Glu Cys Met Glu Thr Ile Lys Glu Thr Cys Leu
 50 55 60
 Tyr Asn Ala Thr Gln Tyr Lys Val Cys Ser Pro Arg Asn Asp Arg
 65 70 75
 Pro Asp Val Cys Tyr Asn Pro Ser Glu Pro Pro Ala Pro Pro Phe
 80 85 90

Leu Lys

<210> 25
 <211> 258
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 2346947CD1

<400> 25
 Met Ala Glu Ser Pro Gly Cys Cys Ser Val Trp Ala Arg Cys Leu
 1 5 10 15
 His Cys Leu Tyr Ser Cys His Trp Arg Lys Cys Pro Arg Glu Arg
 20 25 30
 Met Gln Thr Ser Lys Cys Asp Cys Ile Trp Phe Gly Leu Leu Phe
 35 40 45
 Leu Thr Phe Leu Leu Ser Leu Ser Trp Leu Tyr Ile Gly Leu Val
 50 55 60
 Leu Leu Asn Asp Leu His Asn Phe Asn Glu Phe Leu Phe Arg Arg
 65 70 75
 Trp Gly His Trp Met Asp Trp Ser Leu Ala Phe Leu Leu Val Ile
 80 85 90
 Ser Leu Leu Val Thr Tyr Ala Ser Leu Leu Leu Val Leu Ala Leu
 95 100 105
 Leu Leu Arg Leu Cys Arg Gln Pro Leu His Leu His Ser Leu His
 110 115 120
 Lys Val Leu Leu Leu Leu Ile Met Leu Leu Val Ala Ala Gly Leu
 125 130 135
 Val Gly Leu Asp Ile Gln Trp Gln Gln Glu Trp His Ser Leu Arg
 140 145 150
 Val Ser Leu Gln Ala Thr Ala Pro Phe Leu His Ile Gly Ala Ala
 155 160 165
 Ala Gly Ile Ala Leu Leu Ala Trp Pro Val Ala Asp Thr Phe Tyr
 170 175 180
 Arg Ile His Arg Arg Gly Pro Lys Ile Leu Leu Leu Leu Leu Phe
 185 190 195
 Phe Gly Val Val Leu Val Ile Tyr Leu Ala Pro Leu Cys Ile Ser
 200 205 210
 Ser Pro Cys Ile Met Glu Pro Arg Asp Leu Pro Pro Lys Pro Gly
 215 220 225
 Leu Val Gly His Arg Gly Ala Pro Met Leu Ala Pro Glu Asn Thr
 230 235 240
 Leu Met Ser Leu Arg Lys Thr Ala Glu Cys Gly Leu Leu Cys Leu
 245 250 255
 Arg Leu Met

<210> 26
 <211> 226
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 2795577CD1

<400> 26
 Met Lys Met Val Ala Pro Trp Thr Arg Phe Tyr Ser Asn Ser Cys
 1 5 10 15
 Cys Leu Cys Cys His Val Arg Thr Gly Thr Ile Leu Leu Gly Val
 20 25 30
 Trp Tyr Leu Ile Ile Asn Ala Val Val Leu Leu Ile Leu Leu Ser
 35 40 45
 Ala Leu Ala Asp Pro Asp Gln Tyr Asn Phe Ser Ser Ser Glu Leu
 50 55 60
 Gly Gly Asp Phe Glu Phe Met Asp Asp Ala Asn Met Cys Ile Ala
 65 70 75
 Ile Ala Ile Ser Leu Leu Met Ile Leu Ile Cys Ala Met Ala Thr
 80 85 90
 Tyr Gly Ala Tyr Lys Gln Arg Ala Ala Trp Ile Ile Pro Phe Phe
 95 100 105
 Cys Tyr Gln Ile Phe Asp Phe Ala Leu Asn Met Leu Val Ala Ile
 110 115 120
 Thr Val Leu Ile Tyr Pro Asn Ser Ile Gln Glu Tyr Ile Arg Gln
 125 130 135
 Leu Pro Pro Asn Phe Pro Tyr Arg Asp Asp Val Met Ser Val Asn
 140 145 150
 Pro Thr Cys Leu Val Leu Ile Ile Leu Leu Phe Ile Ser Ile Ile
 155 160 165
 Leu Thr Phe Lys Gly Tyr Leu Ile Ser Cys Val Trp Asn Cys Tyr
 170 175 180
 Arg Tyr Ile Asn Gly Arg Asn Ser Ser Asp Val Leu Val Tyr Val
 185 190 195
 Thr Ser Asn Asp Thr Thr Val Leu Leu Pro Pro Tyr Asp Asp Ala
 200 205 210
 Thr Val Asn Gly Ala Ala Lys Glu Pro Pro Pro Pro Tyr Val Ser
 215 220 225
 Ala

<210> 27
 <211> 136
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 3255825CD1

<400> 27
 Met Ile Ser Ile Thr Glu Trp Gln Lys Ile Gly Val Gly Ile Thr
 1 5 10 15
 Gly Phe Gly Ile Phe Phe Ile Leu Phe Gly Thr Leu Leu Tyr Phe
 20 25 30
 Asp Ser Val Leu Leu Ala Phe Gly Asn Leu Leu Phe Leu Thr Gly
 35 40 45
 Leu Ser Leu Ile Ile Gly Leu Arg Lys Thr Phe Trp Phe Phe Phe
 50 55 60
 Gln Arg His Lys Leu Lys Gly Thr Ser Phe Leu Leu Gly Gly Val
 65 70 75

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ile | Val | Leu | Leu | Arg | Trp | Pro | Leu | Leu | Gly | Met | Phe | Leu | Glu |
| | | | 80 | | | | | | 85 | | | | | 90 |
| Thr | Tyr | Gly | Phe | Phe | Ser | Leu | Phe | Lys | Gly | Phe | Phe | Pro | Val | Ala |
| | | | 95 | | | | | | 100 | | | | | 105 |
| Phe | Gly | Ser | Trp | Ala | Met | Ser | Ala | Thr | Ser | Pro | Ser | Trp | Val | Arg |
| | | | 110 | | | | | | 115 | | | | | 120 |
| Cys | Ser | Gly | Asp | Phe | Lys | Ala | Leu | Ala | Arg | Trp | Ser | Glu | Lys | Gln |
| | | | 125 | | | | | | 130 | | | | | 135 |

Arg

<210> 28

<211> 458

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3393430CD1

<400> 28

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Trp | Ala | Ser | Arg | Leu | Gly | Leu | Leu | Leu | Ala | Leu | Leu | Leu |
| 1 | | | | 5 | | | | 10 | | | | | | 15 |
| Pro | Val | Val | Gly | Ala | Ser | Thr | Pro | Gly | Thr | Val | Val | Arg | Leu | Asn |
| | | | | 20 | | | | 25 | | | | | | 30 |
| Lys | Ala | Ala | Leu | Ser | Tyr | Val | Ser | Glu | Ile | Gly | Lys | Ala | Pro | Leu |
| | | | | 35 | | | | 40 | | | | | | 45 |
| Gln | Arg | Ala | Leu | Gln | Val | Thr | Val | Pro | His | Phe | Leu | Asp | Trp | Ser |
| | | | | 50 | | | | 55 | | | | | | 60 |
| Gly | Glu | Ala | Leu | Gln | Pro | Thr | Arg | Ile | Arg | Ile | Leu | Asn | Val | His |
| | | | | 65 | | | | 70 | | | | | | 75 |
| Val | Pro | Arg | Leu | His | Leu | Lys | Phe | Ile | Ala | Gly | Phe | Gly | Val | Arg |
| | | | | 80 | | | | 85 | | | | | | 90 |
| Leu | Leu | Ala | Ala | Ala | Asn | Phe | Thr | Phe | Lys | Val | Phe | Arg | Ala | Pro |
| | | | | 95 | | | | 100 | | | | | | 105 |
| Glu | Pro | Leu | Glu | Leu | Thr | Leu | Pro | Val | Glu | Leu | Leu | Ala | Asp | Thr |
| | | | | 110 | | | | 115 | | | | | | 120 |
| Arg | Val | Thr | Gln | Ser | Ser | Ile | Arg | Thr | Pro | Val | Val | Ser | Ile | Ser |
| | | | | 125 | | | | 130 | | | | | | 135 |
| Ala | Cys | Ser | Leu | Phe | Ser | Gly | His | Ala | Asn | Glu | Phe | Asp | Gly | Ser |
| | | | | 140 | | | | 145 | | | | | | 150 |
| Asn | Ser | Thr | Ser | His | Ala | Leu | Leu | Val | Leu | Val | Gln | Lys | His | Ile |
| | | | | 155 | | | | 160 | | | | | | 165 |
| Lys | Ala | Val | Leu | Ser | Asn | Lys | Leu | Cys | Leu | Ser | Ile | Ser | Asn | Leu |
| | | | | 170 | | | | 175 | | | | | | 180 |
| Val | Gln | Gly | Val | Asn | Val | His | Leu | Gly | Thr | Leu | Ile | Gly | Leu | Asn |
| | | | | 185 | | | | 190 | | | | | | 195 |
| Pro | Val | Gly | Pro | Glu | Ser | Gln | Ile | Arg | Tyr | Ser | Met | Val | Ser | Val |
| | | | | 200 | | | | 205 | | | | | | 210 |
| Pro | Thr | Val | Thr | Ser | Asp | Tyr | Ile | Ser | Leu | Glu | Val | Asn | Ala | Val |
| | | | | 215 | | | | 220 | | | | | | 225 |
| Leu | Phe | Leu | Leu | Gly | Lys | Pro | Ile | Ile | Leu | Pro | Thr | Asp | Ala | Thr |
| | | | | 230 | | | | 235 | | | | | | 240 |
| Pro | Phe | Val | Leu | Pro | Arg | His | Val | Gly | Thr | Glu | Gly | Ser | Met | Ala |
| | | | | 245 | | | | 250 | | | | | | 255 |
| Thr | Val | Gly | Leu | Ser | Gln | Gln | Leu | Phe | Asp | Ser | Ala | Leu | Leu | Leu |
| | | | | 260 | | | | 265 | | | | | | 270 |
| Leu | Gln | Lys | Ala | Gly | Ala | Leu | Asn | Leu | Asp | Ile | Thr | Gly | Gln | Leu |
| | | | | 275 | | | | 280 | | | | | | 285 |
| Arg | Ser | Asp | Asp | Asn | Leu | Leu | Asn | Thr | Ser | Ala | Leu | Gly | Arg | Leu |
| | | | | 290 | | | | 295 | | | | | | 300 |
| Ile | Pro | Glu | Val | Ala | Arg | Gln | Phe | Pro | Glu | Pro | Met | Pro | Val | Val |
| | | | | 305 | | | | 310 | | | | | | 315 |
| Leu | Lys | Val | Arg | Leu | Gly | Ala | Thr | Pro | Val | Ala | Met | Leu | His | Thr |

| | | | |
|---------------------|-----|-------------------------|-----|
| Asn Asn Ala Thr | 320 | 325 | 330 |
| Leu Arg Leu Gln Pro | 335 | Phe Val Glu Val Leu Ala | 345 |
| Thr Ala Ser Asn | 350 | 340 | 355 |
| Ser Ala Phe Gln Ser | 365 | Leu Phe Ser Leu Asp Val | 375 |
| Val Val Asn Leu | 380 | 355 | 360 |
| Arg Leu Gln Leu Ser | 395 | Val Ser Lys Val Lys Leu | 405 |
| Gln Gly Thr Thr | 410 | 370 | 420 |
| Ser Val Leu Gly Asp | 425 | 385 | 435 |
| Ser Ser Asn Val | 440 | 390 | 450 |
| Gly Phe Ile Asp Thr | 455 | 400 | |
| Met Gly Thr Val | | 415 | |
| Phe Glu Lys Pro Leu | | 430 | |
| Leu Leu Ala Met | | 445 | |
| Gly Ile Ala Leu Pro | | | |
| Tyr Val Ala Pro | | | |
| Glu Ile Phe Val Tyr | | | |
| Ser Ser Gly Leu | | | |
| Phe Tyr Gln Ser | | | |

<210> 29

<211> 368

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3490990CD1

<400> 29

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| Leu Glu Val Gln Leu | 20 | 25 | 30 | 35 |
| Ser Ser Ala Arg Thr | 40 | 45 | 50 | 55 |
| Glu Asn Thr Thr Val | 65 | 70 | 75 | 80 |
| Val Trp Lys Ser Phe | 85 | 90 | 95 | 100 |
| Ile Ser Glu Leu Arg | 110 | 115 | 120 | 125 |
| Leu Ile Val Leu Ser | 130 | 135 | 140 | 145 |
| Glu Arg Leu Leu Gln | 155 | 160 | 165 | 170 |
| Met Val Phe Gly Ala | 175 | 180 | 185 | 190 |
| Met Val Leu Leu Val | 195 | 200 | 205 | 210 |
| Gly Leu Glu Glu Leu | 215 | 220 | 225 | 230 |
| Thr Asn Ile Arg Asn | 235 | 240 | 245 | 250 |
| Val Glu Arg Leu Lys | | | | |
| Lys Asp Leu Arg Ala | | | | |
| Ser Tyr Cys Leu Ile | | | | |
| Asp Ser Glu Leu Ile | | | | |
| Gly Asp Leu Thr Gln | | | | |
| Cys Val Asp Cys Val | | | | |
| Ile Pro Pro Glu Gly | | | | |
| Ser Leu Leu Gln Glu | | | | |
| Ala Leu Ser Gly Phe | | | | |
| Ala Glu Ala Ala Gly | | | | |
| Thr Thr Phe Val Ser | | | | |
| Leu Val Val Ser Gly | | | | |
| Arg Val Val Ala Ala | | | | |
| Thr Glu Gly Trp Trp | | | | |
| Arg Leu Gly Thr Pro | | | | |
| Glu Ala Val Leu Leu | | | | |
| Pro Trp Leu Val Gly | | | | |
| Ser Leu Pro Pro Gln | | | | |
| Thr Ala Arg Asp Tyr | | | | |
| Pro Val Tyr Leu Pro | | | | |
| His Gly Ser Pro Thr | | | | |
| Val Pro His Arg Leu | | | | |
| Leu Leu Thr Leu Thr | | | | |
| Leu Leu Pro Ser Leu | | | | |
| Glu Leu Cys Leu Leu | | | | |
| Cys Gly Pro Ser Pro | | | | |
| Pro Leu Ser Gln Leu | | | | |
| Tyr Pro Gln Leu Leu | | | | |
| Glu Arg Trp Trp Gln | | | | |
| Pro Leu Leu Asp Pro | | | | |
| Leu Arg Ala Cys Leu | | | | |
| Pro Leu Gly Pro Arg | | | | |
| Ala Leu Pro Ser Gly | | | | |
| Phe Pro Leu His Thr | | | | |
| Asp Ile Leu Gly Leu | | | | |
| Leu Leu Leu His Leu | | | | |
| Glu 245 | | | | |

Leu Lys Arg Cys Leu Phe Thr Val Glu Pro Leu Gly Asp Lys Glu
 260 265 270
 Pro Ser Pro Glu Gln Arg Arg Arg Leu Leu Arg Asn Phe Tyr Thr
 275 280 285
 Leu Val Thr Ser Thr His Phe Pro Pro Glu Pro Gly Pro Pro Glu
 290 295 300
 Lys Thr Glu Asp Glu Val Tyr Gln Ala Gln Leu Pro Arg Ala Cys
 305 310 315
 Tyr Leu Val Leu Gly Thr Glu Glu Pro Gly Thr Gly Val Arg Leu
 320 325 330
 Val Ala Leu Gln Leu Gly Leu Arg Arg Leu Leu Leu Leu Ser
 335 340 345
 Pro Gln Ser Pro Thr His Gly Leu Arg Ser Leu Ala Thr His Thr
 350 355 360
 Leu His Ala Leu Thr Pro Leu Leu
 365

<210> 30

<211> 91

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3635154CD1

<400> 30

Met Tyr Gly Lys Ile Ile Phe Val Leu Leu Leu Ser Glu Ile Val
 1 5 10 15
 Ser Ile Ser Ala Ser Ser Thr Thr Gly Val Ala Met His Thr Ser
 20 25 30
 Thr Ser Ser Ser Val Thr Lys Ser Tyr Ile Ser Ser Gln Thr Asn
 35 40 45
 Gly Glu Thr Gly Gln Leu Val His Arg Phe Thr Val Pro Ala Pro
 50 55 60
 Val Val Ile Ile Leu Ile Ile Leu Cys Val Met Ala Gly Ile Ile
 65 70 75
 Gly Thr Ile Leu Leu Phe Ser Tyr Ser Phe Arg Arg Leu Ile Lys
 80 85 90
 Gly

<210> 31

<211> 295

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 4374347CD1

<400> 31

Met Gly Pro Pro Ser Ala Cys Pro His Arg Glu Cys Ile Pro Trp
 1 5 10 15
 Gln Gly Leu Leu Leu Thr Ala Ser Leu Leu Thr Phe Trp Asn Ala
 20 25 30
 Pro Thr Thr Ala Trp Leu Phe Ile Ala Ser Ala Pro Phe Glu Val
 35 40 45
 Ala Glu Gly Glu Asn Val His Leu Ser Val Val Tyr Leu Pro Glu
 50 55 60
 Asn Leu Tyr Ser Tyr Gly Trp Tyr Lys Gly Lys Thr Val Glu Pro
 65 70 75
 Asn Gln Leu Ile Ala Ala Tyr Val Ile Asp Thr His Val Arg Thr
 80 85 90
 Pro Gly Pro Ala Tyr Ser Gly Arg Glu Thr Ile Ser Pro Ser Gly

| | | | | | |
|---------------------|---------------------|-------------------------|-----|--|-----|
| | 95 | | 100 | | 105 |
| Asp Leu His Phe | Gln Asn Val Thr Leu | Glu Asp Thr Gly Tyr Tyr | | | |
| | 110 | | 115 | | 120 |
| Asn Leu Gln Val Thr | Tyr Arg Asn Ser | Gln Ile Glu Gln Ala Ser | | | |
| | 125 | | 130 | | 135 |
| His His Leu Arg Val | Tyr Glu Ser Val | Ala Gln Pro Ser Ile Gln | | | |
| | 140 | | 145 | | 150 |
| Ala Ser Ser Thr Thr | Val Thr Glu Lys | Gly Ser Val Val Leu Thr | | | |
| | 155 | | 160 | | 165 |
| Cys His Thr Asn Asn | Thr Gly Thr Ser | Phe Gln Trp Ile Phe Asn | | | |
| | 170 | | 175 | | 180 |
| Asn Gln Arg Leu Gln | Val Thr Lys Arg | Met Lys Leu Ser Trp Phe | | | |
| | 185 | | 190 | | 195 |
| Asn His Val Leu Thr | Ile Asp Pro Ile | Arg Gln Glu Asp Ala Gly | | | |
| | 200 | | 205 | | 210 |
| Glu Tyr Gln Cys Glu | Val Ser Asn Pro | Val Ser Ser Asn Arg Ser | | | |
| | 215 | | 220 | | 225 |
| Asp Pro Leu Lys Leu | Thr Val Lys Tyr | Asp Asn Thr Leu Gly Ile | | | |
| | 230 | | 235 | | 240 |
| Leu Ile Gly Val Leu | Val Gly Ser Leu | Leu Val Ala Ala Leu Val | | | |
| | 245 | | 250 | | 255 |
| Cys Phe Leu Leu Leu | Arg Lys Thr Gly | Arg Ala Ser Asp Gln Ser | | | |
| | 260 | | 265 | | 270 |
| Asp Phe Arg Glu Gln | Gln Pro Pro Ala | Ser Thr Pro Gly His Gly | | | |
| | 275 | | 280 | | 285 |
| Pro Ser Asp Ser Ser | Asp Ser Ser Ile | Ser | | | |
| | 290 | | 295 | | |

<210> 32

<211> 724

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 4596747CD1

<400> 32

| | | |
|---------------------|---------------------|---------------------|
| Met Phe Asp Thr Thr | Pro His Ser Gly Arg | Ser Thr Pro Ser Ser |
| 1 | 5 | 10 |
| Ser Pro Ser Leu Arg | Lys Arg Leu Gln Leu | Leu Pro Pro Ser Arg |
| | 20 | 25 |
| Pro Pro Pro Glu Pro | Glu Pro Gly Thr Met | Val Glu Lys Gly Ser |
| | 35 | 40 |
| Asp Ser Ser Ser Glu | Lys Gly Gly Val Pro | Gly Thr Pro Ser Thr |
| | 50 | 55 |
| Gln Ser Leu Gly Ser | Arg Asn Phe Ile Arg | Asn Ser Lys Lys Met |
| | 65 | 70 |
| Gln Ser Trp Tyr Ser | Met Leu Ser Pro Thr | Tyr Lys Gln Arg Asn |
| | 80 | 85 |
| Glu Asp Phe Arg Lys | Leu Phe Ser Lys Leu | Pro Glu Ala Glu Arg |
| | 95 | 100 |
| Leu Ile Val Asp Tyr | Ser Cys Ala Leu Gln | Arg Glu Ile Leu Leu |
| | 110 | 115 |
| Gln Gly Arg Leu Tyr | Leu Ser Glu Asn Trp | Ile Cys Phe Tyr Ser |
| | 125 | 130 |
| Asn Ile Phe Arg Trp | Glu Thr Thr Ile Ser | Ile Gln Leu Lys Glu |
| | 140 | 145 |
| Val Thr Cys Leu Lys | Lys Glu Lys Thr Ala | Lys Leu Ile Pro Asn |
| | 155 | 160 |
| Ala Ile Gln Ile Cys | Thr Glu Ser Glu Lys | His Phe Phe Thr Ser |
| | 170 | 175 |
| Phe Gly Ala Arg Asp | Arg Cys Phe Leu Leu | Ile Phe Arg Leu Trp |
| | 185 | 190 |
| | | 195 |

| | | | |
|-----------------|---------------------|---------------------|-----|
| Gln Asn Ala Leu | Leu Glu Lys Thr Leu | Ser Pro Arg Glu Leu | Trp |
| | 200 | 205 | 210 |
| His Leu Val His | Gln Cys Tyr Gly Ser | Glu Leu Gly Leu Thr | Ser |
| | 215 | 220 | 225 |
| Glu Asp Glu Asp | Tyr Val Ser Pro Leu | Gln Leu Asn Gly Leu | Gly |
| | 230 | 235 | 240 |
| Thr Pro Lys Glu | Val Gly Asp Val Ile | Ala Leu Ser Asp Ile | Thr |
| | 245 | 250 | 255 |
| Ser Ser Gly Ala | Ala Asp Arg Ser Gln | Glu Pro Ser Pro Val | Gly |
| | 260 | 265 | 270 |
| Ser Arg Arg Gly | His Val Thr Pro Asn | Leu Ser Arg Ala Ser | Ser |
| | 275 | 280 | 285 |
| Asp Ala Asp His | Gly Ala Glu Glu Asp | Lys Glu Glu Gln Val | Asp |
| | 290 | 295 | 300 |
| Ser Gln Pro Asp | Ala Ser Ser Ser Gln | Thr Val Thr Pro Val | Ala |
| | 305 | 310 | 315 |
| Glu Pro Pro Ser | Thr Glu Pro Thr Gln | Pro Asp Gly Pro Thr | Thr |
| | 320 | 325 | 330 |
| Leu Gly Pro Leu | Asp Leu Leu Pro Ser | Glu Glu Leu Leu Thr | Asp |
| | 335 | 340 | 345 |
| Thr Ser Asn Ser | Ser Ser Ser Thr Gly | Glu Glu Ala Asp Leu | Ala |
| | 350 | 355 | 360 |
| Ala Leu Leu Pro | Asp Leu Ser Gly Arg | Leu Leu Ile Asn Ser | Val |
| | 365 | 370 | 375 |
| Phe His Val Gly | Ala Glu Arg Leu Gln | Gln Met Leu Phe Ser | Asp |
| | 380 | 385 | 390 |
| Ser Pro Phe Leu | Gln Gly Phe Leu Gln | Gln Cys Lys Phe Thr | Asp |
| | 395 | 400 | 405 |
| Val Thr Leu Ser | Pro Trp Ser Gly Asp | Ser Lys Cys His Gln | Arg |
| | 410 | 415 | 420 |
| Arg Val Leu Thr | Tyr Thr Ile Pro Ile | Ser Asn Pro Leu Gly | Pro |
| | 425 | 430 | 435 |
| Lys Ser Ala Ser | Val Val Glu Thr Gln | Thr Leu Phe Arg Arg | Gly |
| | 440 | 445 | 450 |
| Pro Gln Ala Gly | Gly Cys Val Val Asp | Ser Glu Val Leu Thr | Gln |
| | 455 | 460 | 465 |
| Gly Ile Pro Tyr | Gln Asp Tyr Phe Tyr | Thr Ala His Arg Tyr | Cys |
| | 470 | 475 | 480 |
| Ile Leu Gly Leu | Ala Arg Asn Lys Ala | Arg Leu Arg Val Ser | Ser |
| | 485 | 490 | 495 |
| Glu Ile Arg Tyr | Arg Lys Gln Pro Trp | Ser Leu Val Lys Ser | Leu |
| | 500 | 505 | 510 |
| Ile Glu Lys Asn | Ser Trp Ser Gly Ile | Glu Asp Tyr Phe His | His |
| | 515 | 520 | 525 |
| Leu Glu Arg Glu | Leu Ala Lys Ala Glu | Lys Leu Ser Leu Glu | Glu |
| | 530 | 535 | 540 |
| Gly Gly Lys Asp | Ala Arg Gly Leu Leu | Ser Gly Leu Arg Arg | Arg |
| | 545 | 550 | 555 |
| Lys Arg Pro Leu | Ser Trp Arg Ala His | Gly Asp Gly Pro Gln | His |
| | 560 | 565 | 570 |
| Pro Asp Pro Asp | Pro Cys Ala Arg Ala | Gly Ile His Thr Ser | Gly |
| | 575 | 580 | 585 |
| Ser Leu Ser Ser | Arg Phe Ser Glu Pro | Ser Val Asp Gln Gly | Pro |
| | 590 | 595 | 600 |
| Gly Ala Gly Ile | Pro Ser Ala Leu Val | Leu Ile Ser Ile Val | Ile |
| | 605 | 610 | 615 |
| Cys Val Ser Leu | Ile Ile Leu Ile Ala | Leu Asn Val Leu Leu | Phe |
| | 620 | 625 | 630 |
| Tyr Arg Leu Trp | Ser Leu Glu Arg Thr | Ala His Thr Phe Glu | Ser |
| | 635 | 640 | 645 |
| Trp His Ser Leu | Ala Leu Ala Lys Gly | Lys Phe Pro Gln Thr | Ala |
| | 650 | 655 | 660 |
| Thr Glu Trp Ala | Glu Ile Leu Ala Leu | Gln Lys Gln Phe His | Ser |

| | | | |
|---------------------|-----|---------------------|-----|
| Val Glu Val His | 665 | Leu Arg Ala Ser Val | 675 |
| Lys Trp Arg Gln Ile | 680 | Glu Lys Leu His Gln | 690 |
| Met Lys Phe Ser Leu | 695 | Thr Gln Pro Arg Pro | 705 |
| Asp Pro Pro Phe Asp | 710 | Asp | 720 |
| Asp Ser Phe Ser | | | |

<210> 33

<211> 331

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 5052680CD1

<400> 33

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|---------------------|-----|---------------------|-----|---------------------|-----|
| Met Arg Pro Ala Leu | 1 | Ala Val Gly Leu Val | 10 | Phe Ala Gly Cys Cys | 15 |
| Ser Asn Val Ile Phe | 20 | Leu Glu Leu Leu Ala | 25 | Arg Lys His Pro Gly | 30 |
| Cys Gly Asn Ile Val | 35 | Thr Phe Ala Gln Phe | 40 | Leu Phe Ile Ala Val | 45 |
| Glu Gly Phe Leu Phe | 50 | Glu Ala Asp Leu Gly | 55 | Arg Lys Pro Pro Ala | 60 |
| Ile Pro Ile Arg Tyr | 65 | Tyr Ala Ile Met Val | 70 | Thr Met Phe Phe Thr | 75 |
| Val Ser Val Val Asn | 80 | Asn Tyr Ala Leu Asn | 85 | Leu Asn Ile Ala Met | 90 |
| Pro Leu His Met Ile | 95 | Phe Arg Ser Gly Ser | 100 | Leu Ile Ala Asn Met | 105 |
| Ile Leu Gly Ile Ile | 110 | Ile Leu Lys Lys Arg | 115 | Tyr Ser Ile Phe Lys | 120 |
| Tyr Thr Ser Ile Ala | 125 | Leu Val Ser Val Gly | 130 | Ile Phe Ile Cys Thr | 135 |
| Phe Met Ser Ala Lys | 140 | Gln Val Thr Ser Gln | 145 | Ser Ser Leu Ser Glu | 150 |
| Asn Asp Gly Phe Gln | 155 | Ala Phe Val Trp Trp | 160 | Leu Leu Gly Ile Gly | 165 |
| Ala Leu Thr Phe Ala | 170 | Leu Leu Met Ser Ala | 175 | Arg Met Gly Ile Phe | 180 |
| Gln Glu Thr Leu Tyr | 185 | Lys Arg Phe Gly Lys | 190 | His Ser Lys Glu Ala | 195 |
| Leu Phe Tyr Asn His | 200 | Ala Leu Pro Leu Pro | 205 | Gly Phe Val Phe Leu | 210 |
| Ala Ser Asp Ile Tyr | 215 | Asp His Ala Val Leu | 220 | Phe Asn Lys Ser Glu | 225 |
| Leu Tyr Glu Ile Pro | 230 | Val Ile Gly Val Thr | 235 | Leu Pro Ile Met Trp | 240 |
| Phe Tyr Leu Leu Met | 245 | Asn Ile Ile Thr Gln | 250 | Tyr Val Cys Ile Arg | 255 |
| Gly Val Phe Ile Leu | 260 | Thr Thr Glu Cys Ala | 265 | Ser Leu Thr Val Thr | 270 |
| Leu Val Val Thr Leu | 275 | Arg Lys Phe Val Ser | 280 | Leu Ile Phe Ser Ile | 285 |
| Leu Tyr Phe Gln Asn | 290 | Pro Phe Thr Leu Trp | 295 | His Trp Leu Gly Thr | 300 |
| Leu Phe Val Phe Ile | 305 | Gly Thr Leu Met Tyr | 310 | Thr Glu Val Trp Asn | 315 |
| Asn Leu Gly Thr Thr | 320 | Lys Ser Glu Pro Gln | 325 | Lys Asp Ser Lys Lys | 330 |

Asn

<210> 34

<211> 398

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 5373575CD1

<400> 34

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Met Leu Gly Arg Ser Gly Tyr Arg Ala Leu Pro Leu Gly Asp Phe
 1          5          10          15
Asp Arg Phe Gln Gln Ser Ser Phe Gly Phe Leu Gly Ser Gln Lys
          20          25          30
Gly Cys Leu Ser Pro Glu Arg Gly Gly Val Gly Thr Gly Ala Asp
          35          40          45
Val Pro Gln Ser Trp Pro Ser Cys Leu Cys His Gly Leu Ile Ser
          50          55          60
Phe Leu Gly Phe Leu Leu Leu Val Thr Phe Pro Ile Ser Gly
          65          70          75
Trp Phe Ala Leu Lys Ile Val Pro Thr Tyr Glu Arg Met Ile Val
          80          85          90
Phe Arg Leu Gly Arg Ile Arg Thr Pro Gln Gly Pro Gly Met Val
          95          100          105
Leu Leu Leu Pro Phe Ile Asp Ser Phe Gln Arg Val Asp Leu Arg
          110          115          120
Thr Arg Ala Phe Asn Val Pro Pro Cys Lys Leu Ala Ser Lys Asp
          125          130          135
Gly Ala Val Leu Ser Val Gly Ala Asp Val Gln Phe Arg Ile Trp
          140          145          150
Asp Pro Val Leu Ser Val Met Thr Val Lys Asp Leu Asn Thr Ala
          155          160          165
Thr Arg Met Thr Ala Gln Asn Ala Met Thr Lys Ala Leu Leu Lys
          170          175          180
Arg Pro Leu Arg Glu Ile Gln Met Glu Lys Leu Lys Ile Ser Asp
          185          190          195
Gln Leu Leu Leu Glu Ile Asn Asp Val Thr Arg Ala Trp Gly Leu
          200          205          210
Glu Val Asp Arg Val Glu Leu Ala Val Glu Ala Val Leu Gln Pro
          215          220          225
Pro Gln Asp Ser Pro Ala Gly Pro Asn Leu Asp Ser Thr Leu Gln
          230          235          240
Gln Leu Ala Leu His Phe Leu Gly Gly Ser Met Asn Ser Met Ala
          245          250          255
Gly Gly Ala Pro Ser Pro Gly Pro Ala Asp Thr Val Glu Met Val
          260          265          270
Ser Glu Val Glu Pro Pro Ala Pro Gln Val Gly Ala Arg Ser Ser
          275          280          285
Pro Lys Gln Pro Leu Ala Glu Gly Leu Leu Thr Ala Leu Gln Pro
          290          295          300
Phe Leu Ser Glu Ala Leu Val Ser Gln Val Gly Ala Cys Tyr Gln
          305          310          315
Phe Asn Val Val Leu Pro Ser Gly Thr Gln Ser Ala Tyr Phe Leu
          320          325          330
Asp Leu Thr Thr Gly Arg Gly Arg Val Gly His Gly Val Pro Asp
          335          340          345
Gly Ile Pro Asp Val Val Val Glu Met Ala Glu Ala Asp Leu Arg
          350          355          360
Ala Leu Leu Cys Arg Glu Leu Arg Pro Leu Gly Ala Tyr Met Ser
          365          370          375
Gly Arg Leu Lys Val Lys Gly Asp Leu Ala Met Ala Met Lys Leu

```

380
Glu Ala Val Leu Arg Ala Leu Lys
395

385

390

<210> 35
<211> 220
<212> PRT
<213> Homo sapiens

<220>
<221> misc_feature
<223> Incyte ID No: 5524468CD1

<400> 35
Met Thr Trp Leu Val Leu Leu Gly Thr Leu Leu Cys Met Leu Arg
1 5 10 15
Val Gly Leu Gly Thr Pro Asp Ser Glu Gly Phe Pro Pro Arg Ala
20 25 30
Leu His Asn Cys Pro Tyr Lys Cys Ile Cys Ala Ala Asp Leu Leu
35 40 45
Ser Cys Thr Gly Leu Gly Leu Gln Asp Val Pro Ala Glu Leu Pro
50 55 60
Ala Ala Thr Ala Asp Leu Asp Leu Ser His Asn Ala Leu Gln Arg
65 70 75
Leu Arg Pro Gly Trp Leu Ala Pro Leu Phe Gln Leu Arg Ala Leu
80 85 90
His Leu Asp His Asn Glu Leu Asp Ala Leu Gly Arg Gly Val Phe
95 100 105
Val Asn Ala Ser Gly Leu Arg Leu Leu Asp Leu Ser Ser Asn Thr
110 115 120
Leu Arg Ala Leu Gly Arg His Asp Leu Asp Gly Leu Gly Ala Leu
125 130 135
Glu Lys Leu Leu Phe Asn Asn Arg Leu Val His Leu Asp Glu
140 145 150
His Ala Phe His Gly Leu Arg Ala Leu Ser His Leu Tyr Leu Gly
155 160 165
Cys Asn Glu Leu Ala Ser Phe Ser Phe Asp His Leu His Gly Leu
170 175 180
Ser Ala Thr His Leu Leu Thr Leu Asp Leu Ser Ser Asn Arg Leu
185 190 195
Gly His Ile Ser Val Pro Glu Leu Ala Ala Leu Pro Ala Phe Leu
200 205 210
Lys Asn Gly Leu Tyr Leu His Asp Asn Thr
215 220

<210> 36
<211> 706
<212> PRT
<213> Homo sapiens

<220>
<221> misc_feature
<223> Incyte ID No: 5944279CD1

<400> 36
Met Glu Glu Asn Pro Thr Leu Glu Ser Glu Ala Trp Gly Ser Ser
1 5 10 15
Arg Gly Trp Leu Ala Pro Arg Glu Ala Arg Gly Gly Pro Ser Leu
20 25 30
Ser Ser Val Leu Asn Glu Leu Pro Ser Ala Ala Thr Leu Arg Tyr
35 40 45
Arg Asp Pro Gly Val Leu Pro Trp Gly Ala Leu Glu Glu Glu Glu
50 55 60
Glu Asp Gly Gly Arg Ser Arg Lys Ala Phe Thr Glu Val Thr Gln
65 70 75

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Thr | Glu | Leu | Gln | Asp | Pro | His | Pro | Ser | Arg | Glu | Leu | Pro | Trp | Pro | |
| | | | | 80 | | | | | 85 | | | | | 90 | |
| Met | Gln | Ala | Arg | Arg | Ala | His | Arg | Gln | Arg | Asn | Ala | Ser | Arg | Asp | |
| | | | | 95 | | | | | 100 | | | | | 105 | |
| Gln | Val | Val | Tyr | Gly | Ser | Gly | Thr | Lys | Thr | Asp | Arg | Trp | Ala | Arg | |
| | | | | 110 | | | | | 115 | | | | | 120 | |
| Leu | Leu | Arg | Arg | Ser | Lys | Glu | Lys | Thr | Lys | Glu | Gly | Leu | Arg | Ser | |
| | | | | 125 | | | | | 130 | | | | | 135 | |
| Leu | Gln | Pro | Trp | Ala | Trp | Thr | Leu | Lys | Arg | Ile | Gly | Gly | Gln | Phe | |
| | | | | 140 | | | | | 145 | | | | | 150 | |
| Gly | Ala | Gly | Thr | Glu | Ser | Tyr | Phe | Ser | Leu | Leu | Arg | Phe | Leu | Leu | |
| | | | | 155 | | | | | 160 | | | | | 165 | |
| Leu | Leu | Asn | Val | Leu | Ala | Ser | Val | Leu | Met | Ala | Cys | Met | Thr | Leu | |
| | | | | 170 | | | | | 175 | | | | | 180 | |
| Leu | Pro | Thr | Trp | Leu | Gly | Gly | Ala | Pro | Pro | Gly | Pro | Pro | Gly | Pro | |
| | | | | 185 | | | | | 190 | | | | | 195 | |
| Asp | Ile | Ser | Ser | Pro | Cys | Gly | Ser | Tyr | Asn | Pro | His | Ser | Gln | Gly | |
| | | | | 200 | | | | | 205 | | | | | 210 | |
| Leu | Val | Thr | Phe | Ala | Thr | Gln | Leu | Phe | Asn | Leu | Leu | Ser | Gly | Glu | |
| | | | | 215 | | | | | 220 | | | | | 225 | |
| Gly | Tyr | Leu | Glu | Trp | Ser | Pro | Leu | Phe | Tyr | Gly | Phe | Tyr | Pro | Pro | |
| | | | | 230 | | | | | 235 | | | | | 240 | |
| Arg | Pro | Arg | Leu | Ala | Val | Thr | Tyr | Leu | Cys | Trp | Ala | Phe | Ala | Val | |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| Gly | Leu | Ile | Cys | Leu | Leu | Leu | Ile | Leu | His | Arg | Ser | Val | Ser | Gly | |
| | | | | 260 | | | | | 265 | | | | | 270 | |
| Leu | Lys | Gln | Thr | Leu | Leu | Ala | Glu | Ser | Glu | Ala | Leu | Thr | Ser | Tyr | |
| | | | | 275 | | | | | 280 | | | | | 285 | |
| Ser | His | Arg | Val | Phe | Ser | Ala | Trp | Asp | Phe | Gly | Leu | Cys | Gly | Asp | |
| | | | | 290 | | | | | 295 | | | | | 300 | |
| Val | His | Val | Arg | Leu | Arg | Gln | Arg | Ile | Ile | Leu | Tyr | Glu | Leu | Lys | |
| | | | | 305 | | | | | 310 | | | | | 315 | |
| Val | Glu | Leu | Glu | Glu | Thr | Val | Val | Arg | Arg | Gln | Ala | Ala | Val | Arg | |
| | | | | 320 | | | | | 325 | | | | | 330 | |
| Thr | Leu | Gly | Gln | Gln | Ala | Arg | Val | Trp | Leu | Val | Arg | Val | Leu | Leu | |
| | | | | 335 | | | | | 340 | | | | | 345 | |
| Asn | Leu | Leu | Val | Val | Ala | Leu | Leu | Gly | Ala | Ala | Phe | Tyr | Gly | Val | |
| | | | | 350 | | | | | 355 | | | | | 360 | |
| Tyr | Trp | Ala | Thr | Gly | Cys | Thr | Val | Glu | Leu | Gln | Glu | Met | Pro | Leu | |
| | | | | 365 | | | | | 370 | | | | | 375 | |
| Val | Gln | Glu | Leu | Pro | Leu | Leu | Lys | Leu | Gly | Val | Asn | Tyr | Leu | Pro | |
| | | | | 380 | | | | | 385 | | | | | 390 | |
| Ser | Ile | Phe | Ile | Ala | Gly | Val | Asn | Phe | Val | Leu | Pro | Pro | Val | Phe | |
| | | | | 395 | | | | | 400 | | | | | 405 | |
| Lys | Leu | Ile | Ala | Pro | Leu | Glu | Gly | Tyr | Thr | Arg | Ser | Arg | Gln | Ile | |
| | | | | 410 | | | | | 415 | | | | | 420 | |
| Val | Phe | Ile | Leu | Leu | Arg | Thr | Val | Phe | Leu | Arg | Leu | Ala | Ser | Leu | |
| | | | | 425 | | | | | 430 | | | | | 435 | |
| Val | Val | Leu | Leu | Phe | Ser | Leu | Trp | Asn | Gln | Ile | Thr | Cys | Gly | Gly | |
| | | | | 440 | | | | | 445 | | | | | 450 | |
| Asp | Ser | Glu | Ala | Glu | Asp | Cys | Lys | Thr | Cys | Gly | Tyr | Asn | Tyr | Lys | |
| | | | | 455 | | | | | 460 | | | | | 465 | |
| Gln | Leu | Pro | Cys | Trp | Glu | Thr | Val | Leu | Gly | Gln | Glu | Met | Tyr | Lys | |
| | | | | 470 | | | | | 475 | | | | | 480 | |
| Leu | Leu | Leu | Phe | Asp | Leu | Leu | Thr | Val | Leu | Ala | Val | Ala | Leu | Leu | |
| | | | | 485 | | | | | 490 | | | | | 495 | |
| Ile | Gln | Phe | Pro | Arg | Lys | Leu | Leu | Cys | Gly | Leu | Cys | Pro | Gly | Ala | |
| | | | | 500 | | | | | 505 | | | | | 510 | |
| Leu | Gly | Arg | Leu | Ala | Gly | Thr | Gln | Glu | Phe | Gln | Val | Pro | Asp | Glu | |
| | | | | 515 | | | | | 520 | | | | | 525 | |
| Val | Leu | Gly | Leu | Ile | Tyr | Ala | Gln | Thr | Val | Val | Trp | Val | Gly | Ser | |
| | | | | 530 | | | | | 535 | | | | | 540 | |
| Phe | Phe | Cys | Pro | Leu | Leu | Pro | Leu | Leu | Asn | Thr | Val | Lys | Phe | Leu | |

| | | | | | |
|-----------------|---------------------|-------------------------|-----|--|-----|
| | 545 | | 550 | | 555 |
| Leu Leu Phe Tyr | Leu Lys Lys Leu Thr | Leu Phe Ser Thr Cys Ser | | | |
| | 560 | | 565 | | 570 |
| Pro Ala Ala Arg | Thr Phe Arg Ala Ser | Ala Ala Asn Phe Phe Phe | | | |
| | 575 | | 580 | | 585 |
| Pro Leu Val Leu | Leu Leu Gly Leu Ala | Ile Ser Ser Val Pro Leu | | | |
| | 590 | | 595 | | 600 |
| Leu Tyr Ser Ile | Phe Leu Ile Pro Pro | Ser Lys Leu Cys Gly Pro | | | |
| | 605 | | 610 | | 615 |
| Phe Arg Gly Gln | Ser Ser Ile Trp Ala | Gln Ile Pro Glu Ser Ile | | | |
| | 620 | | 625 | | 630 |
| Ser Ser Leu Pro | Glu Thr Thr Gln Asn | Phe Leu Phe Phe Leu Gly | | | |
| | 635 | | 640 | | 645 |
| Thr Gln Ala Phe | Ala Val Pro Leu Leu | Leu Ile Ser Ser Ile Leu | | | |
| | 650 | | 655 | | 660 |
| Met Ala Tyr Thr | Val Ala Leu Ala Asn | Ser Tyr Gly Arg Leu Ile | | | |
| | 665 | | 670 | | 675 |
| Ser Glu Leu Lys | Arg Gln Arg Gln Thr | Glu Ala Gln Asn Lys Val | | | |
| | 680 | | 685 | | 690 |
| Phe Leu Ala Arg | Arg Ala Val Ala Leu | Thr Ser Thr Lys Pro Ala | | | |
| | 695 | | 700 | | 705 |

Leu

<210> 37

<211> 466

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 6114480CD1

<400> 37

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| 1 | 5 | 10 | 15 |
| Ser Gly Gln Trp | Gln Val Thr Gly Pro | Gly Lys Phe Val Gln Ala | |
| | 20 | 25 | 30 |
| Leu Val Gly Glu | Asp Ala Val Phe Ser | Cys Ser Leu Phe Pro Glu | |
| | 35 | 40 | 45 |
| Thr Ser Ala Glu | Ala Met Glu Val Arg | Phe Phe Arg Asn Gln Phe | |
| | 50 | 55 | 60 |
| His Ala Val Val | His Leu Tyr Arg Asp | Gly Glu Asp Trp Glu Ser | |
| | 65 | 70 | 75 |
| Lys Gln Met Pro | Gln Tyr Arg Gly Arg | Thr Glu Phe Val Lys Asp | |
| | 80 | 85 | 90 |
| Ser Ile Ala Gly | Gly Arg Val Ser Leu | Arg Leu Lys Asn Ile Thr | |
| | 95 | 100 | 105 |
| Pro Ser Asp Ile | Gly Leu Tyr Gly Cys | Trp Phe Ser Ser Gln Ile | |
| | 110 | 115 | 120 |
| Tyr Asp Glu Glu | Ala Thr Trp Glu Leu | Arg Val Ala Ala Leu Gly | |
| | 125 | 130 | 135 |
| Ser Leu Pro Leu | Ile Ser Ile Val Gly | Tyr Val Asp Gly Gly Ile | |
| | 140 | 145 | 150 |
| Gln Leu Leu Cys | Leu Ser Ser Gly Trp | Phe Pro Gln Pro Thr Ala | |
| | 155 | 160 | 165 |
| Lys Trp Lys Gly | Pro Gln Gly Gln Asp | Leu Ser Ser Asp Ser Arg | |
| | 170 | 175 | 180 |
| Ala Asn Ala Asp | Gly Tyr Ser Leu Tyr | Asp Val Glu Ile Ser Ile | |
| | 185 | 190 | 195 |
| Ile Val Gln Glu | Asn Ala Gly Ser Ile | Leu Cys Ser Ile His Leu | |
| | 200 | 205 | 210 |
| Ala Glu Gln Ser | His Glu Val Glu Ser | Lys Val Leu Ile Gly Glu | |
| | 215 | 220 | 225 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Thr | Phe | Phe | Gln | Pro | Ser | Pro | Trp | Arg | Leu | Ala | Ser | Ile | Leu | Leu | |
| | | | | 230 | | | | | 235 | | | | | 240 | |
| Gly | Leu | Leu | Cys | Gly | Ala | Leu | Cys | Gly | Val | Val | Met | Gly | Met | Ile | |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| Ile | Val | Phe | Phe | Lys | Ser | Lys | Gly | Lys | Ile | Gln | Ala | Glu | Leu | Asp | |
| | | | | 260 | | | | | 265 | | | | | 270 | |
| Trp | Arg | Arg | Lys | His | Gly | Gln | Ala | Glu | Leu | Arg | Asp | Ala | Arg | Lys | |
| | | | | 275 | | | | | 280 | | | | | 285 | |
| His | Ala | Val | Glu | Val | Thr | Leu | Asp | Pro | Glu | Thr | Ala | His | Pro | Lys | |
| | | | | 290 | | | | | 295 | | | | | 300 | |
| Leu | Cys | Val | Ser | Asp | Leu | Lys | Thr | Val | Thr | His | Arg | Lys | Ala | Pro | |
| | | | | 305 | | | | | 310 | | | | | 315 | |
| Gln | Glu | Val | Pro | His | Ser | Glu | Lys | Arg | Phe | Thr | Arg | Lys | Ser | Val | |
| | | | | 320 | | | | | 325 | | | | | 330 | |
| Val | Ala | Ser | Gln | Gly | Phe | Gln | Ala | Gly | Arg | His | Tyr | Trp | Glu | Val | |
| | | | | 335 | | | | | 340 | | | | | 345 | |
| Asp | Val | Gly | Gln | Asn | Val | Gly | Trp | Tyr | Val | Gly | Val | Cys | Arg | Asp | |
| | | | | 350 | | | | | 355 | | | | | 360 | |
| Asp | Val | Asp | Arg | Gly | Lys | Asn | Asn | Val | Thr | Leu | Ser | Pro | Asn | Asn | |
| | | | | 365 | | | | | 370 | | | | | 375 | |
| Gly | Tyr | Trp | Val | Leu | Arg | Leu | Thr | Thr | Glu | His | Leu | Tyr | Phe | Thr | |
| | | | | 380 | | | | | 385 | | | | | 390 | |
| Phe | Asn | Pro | His | Phe | Ile | Ser | Leu | Pro | Pro | Ser | Thr | Pro | Pro | Thr | |
| | | | | 395 | | | | | 400 | | | | | 405 | |
| Arg | Val | Gly | Val | Phe | Leu | Asp | Tyr | Glu | Gly | Gly | Thr | Ile | Ser | Phe | |
| | | | | 410 | | | | | 415 | | | | | 420 | |
| Phe | Asn | Thr | Asn | Asp | Gln | Ser | Leu | Ile | Tyr | Thr | Leu | Leu | Thr | Cys | |
| | | | | 425 | | | | | 430 | | | | | 435 | |
| Gln | Phe | Glu | Gly | Leu | Leu | Arg | Pro | Tyr | Ile | Gln | His | Ala | Met | Tyr | |
| | | | | 440 | | | | | 445 | | | | | 450 | |
| Asp | Glu | Glu | Lys | Gly | Thr | Pro | Ile | Phe | Ile | Cys | Pro | Val | Ser | Trp | |
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<210> 38

<211> 2801

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 112301CB1

<400> 38

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| cgcggtggc | ggcacgtccc | tccagacagt | accacaggca | cctggagtag | cggcatcggt | 120 |
| cgctgtggcc | cccagtggtc | cgtcagagcc | taggggagcc | tgccctcccg | cgctcgtcg | 180 |
| gggcccggcc | aggcaccttg | gccgcggcg | cacggacgcg | ggcacgagca | ctagatcacg | 240 |
| gctgctggac | ctcggcacgt | tgacaagatt | tctctggggg | accgcgagg | attactttga | 300 |
| atttcggtgg | tcgcctgtgg | tctggcatat | ttagaactta | agtctattat | ttcgggcacc | 360 |
| atgactttga | ggcttttaga | agactggtgc | agggggatgg | acatgaaccc | tcggaaagcg | 420 |
| ctattgattg | cggcatctc | ccagagctgc | agtgtggcag | aaatcgagga | ggctctgcag | 480 |
| gctggtttag | ctcccttggg | ggagtacaga | ctgcttgga | ggatgttcag | gagggatgag | 540 |
| aacaggaaag | tagccttagt | agggcttact | gcggagacta | gtcacgccct | ggccctaag | 600 |
| gagataccgg | gaaaaggggg | tatctggaga | gtgatcttta | agccccctga | cccagataat | 660 |
| acatttttaa | gcagattaaa | tgaattttta | gcgggagagg | gcatgacagt | gggtgagttg | 720 |
| agcagagctc | ttggacatga | aaatggctcc | ttagaccag | agcagggcat | gatcccgga | 780 |
| atgtggggcc | ctatgttggc | acaggcatta | gaggtcttcc | agcctgcctc | gcaatgcttg | 840 |
| aagtataaaa | agctgagagt | gttctcgggc | agggagtctc | cagaaccagg | agaagaagaa | 900 |
| tttggacgct | ggatgttca | tactactcag | atgataaagg | cgtggcaggt | gccagatgta | 960 |
| gagaagagaa | ggcgattgct | agagagcctt | cgaggccag | cacttgatgt | tattcgtgtc | 1020 |
| ctcaagataa | acaatccttt | aattactgtc | gatgaatgtc | tgagggtct | tgaggaggta | 1080 |
| tttgggggta | cagataatcc | tagggagttg | caggtcaaat | atctaaccac | ttaccagaag | 1140 |

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ggtttcttgc agttattggg actaataaag gattatgagg cagctgagga ggaggaggcc 1380
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<211> 2656

<212> DNA

<213> Homo sapiens

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<223> Incyte ID No: 997947CB1

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<221> unsure

<222> 2554, 2587, 2604, 2606, 2611, 2644, 2646-2647, 2651

<223> a, t, c, g, or other

<400> 39

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aagggtgtaa ggcaaaattt cggcagattg aagatgatcg aaagacactt atgaccaagc 600
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<211> 968

<212> DNA

<213> Homo sapiens

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<223> Incyte ID No: 1521513CB1

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aatgtgtaaa gaaggaagag caagaacatg gccacacca ccgccccaca cgagaaattt 900
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<210> 41

<211> 1837

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1863994CB1

<400> 41

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<211> 2124

<212> DNA

<213> Homo sapiens

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<221> misc_feature

<223> Incyte ID No: 2071941CB1

<400> 42

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<210> 43

<211> 993

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2172512CB1

<400> 43

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<210> 44

<211> 2214

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2483172CB1

<400> 44

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tgacactgtt ggaagactgg tgccggggga tggatgtgaa ctcccagaga gctctgttag 420
tctggggcat cccagtgaac tgtgatgagg ctgaaatcga agagaccctc caggctgcga 480

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<210> 45

<211> 897

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2656128CB1

<400> 45

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<210> 46

<211> 2167

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 5855841CB1

<400> 46

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<210> 47

<211> 1235

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 603462CB1

<400> 47

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<210> 48

<211> 2257

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 747681CB1

<400> 48

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<210> 49

<211> 2359

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 919469CB1

<400> 49

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2359

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<211> 2052

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 977658CB1

<400> 50

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| | | | | | | |
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| tgtaccaggc | catcttccat | gctgtggacc | agtacctggc | gttgccctgac | gtgtcactgg | 540 |
| gccggtatgc | gtatgtccgt | ggtgggggtg | acccttggac | caatggctca | gggcttgctc | 600 |
| tctgccagcg | gtactaccac | cgaggccacg | tggaccggc | caacgacaca | tttgacattg | 660 |
| atccgatggg | ggttactgac | tgcattccagg | tggatccccc | cgagcggccc | cctccgcccc | 720 |
| ccagcgacga | tctcaccctc | ttggaaagca | gctccagtta | caagaacctc | acgtcaaat | 780 |
| tccacaagct | ggtcaatgtc | accatccact | tccggctgaa | gaccattaac | ctccagagcc | 840 |
| tcatcaataa | tgagatcccc | gactgctata | ccttcagcgt | cctgatcacg | tttgacaaca | 900 |
| aagcacacag | tgggcggatc | cccatcagcc | tggagacca | ggccccacatc | caggagtgtg | 960 |
| agcacccccag | tgtcttccag | cacggagaca | acagcttccg | gctcctgttt | gacgtgggtg | 1020 |
| tcatcctcac | ctgctccctg | tccttctctc | tctgcgccc | ctcactcctt | cgaggcttcc | 1080 |
| tgctgcagaa | tgagtttgtg | gggttcatgt | ggcggcagcg | gggacgggtc | atcagcctgt | 1140 |
| gggagcggct | ggaatttgtc | aatggctggt | acatcctgct | cgtcaccagc | gatgtgctca | 1200 |
| ccatctcggg | caccatcatg | aagatcggca | tcgaggcaa | gaacttggcg | agctacgacg | 1260 |
| tctgcagcat | cctcctgggc | acctcgacgc | tgctggtgtg | ggtgggcgtg | atccgctacc | 1320 |
| tgaccttctt | ccacaactac | aatatcctca | tcgccacact | gcgggtggcc | ctgcccagcg | 1380 |
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| tcgtgctggg | gccctatcat | gtgaagtccc | gctcactctc | catggtgtct | gagtgcctgt | 1500 |
| tctcgctcat | caatggggac | gacatgtttg | tgacgttcgc | cgccatgcag | gcgcagcagg | 1560 |
| gccgcagcag | cctgggtgtg | ctcttctccc | agctctacct | ttactccttc | atcagcctct | 1620 |
| tcattctacat | gtgtctcagc | ctcttcacgc | cgctcatcac | cggcgccctac | gacaccatca | 1680 |
| agcatcccg | ggcgcagcg | gcagaggaga | gcgagctgca | ggcctacatc | gcacagtgc | 1740 |
| aggacagccc | cacctccggc | aagtcccgcc | gcgggagcgg | ctcggcctgc | agccttctct | 1800 |
| gctgctgcgg | aagggaaccc | tcggaggagc | attcgctgct | ggtgaattga | ttcgacctga | 1860 |
| ctgccgttgg | accgtagggc | ctggactgca | gagaccccc | cccccgaccc | cgcttatatta | 1920 |
| ttttaggggt | ttctttttaa | ggatcggctc | cctgtcgcgc | ccgaggagg | cctggacctt | 1980 |
| tcgtgtcgga | cccttggggg | cggggagact | gggtggggag | ggtgttgaat | aaaagggaaa | 2040 |
| ataaaaaaaaa | aa | | | | | 2052 |

<210> 51

<211> 1939

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1004703CB1

<400> 51

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| cgtgtgaggg | ggcctgtggc | ccagcgtgct | gtggcctcgg | ggagtgggaa | gtggaggcag | 120 |
| gagccttcc | tacacttcgc | catgagtctc | ctcatcgact | ccagcatcat | gattacctcc | 180 |
| cagatactat | tttttggatt | tgggtggctt | ttcttcatgc | gccaattgtt | taaagactgt | 240 |
| gagatacgtc | agtatgttgt | acaggtgac | ttctccgtga | cgtttgcatt | ttcttgcacc | 300 |
| atgtttgagc | tcatcatctt | tgaaatctta | ggagtattga | atagcagctc | ccgttatattt | 360 |
| cactggaaaa | tgaacctgtg | tgtaatctct | ctgatcctgg | ttttcatggt | gcctttttac | 420 |
| attggctatt | ttattgtgag | caatatccga | ctactgcata | aacaacgact | gcttttttcc | 480 |
| tgtctcttat | ggctgacctt | tatgtatttc | ttctggaaac | taggagatct | ctttccatt | 540 |
| ctcagcccaa | aacatgggat | cttatccata | gaacagctca | tcagccgggt | tgggtgtgatt | 600 |
| ggagtgactc | tcatggctct | tctttctgga | tttggtgctg | tcaactgccc | atacacttac | 660 |
| atgtcttact | tcctcaggaa | tgtgactgac | acggatattc | tagccctgga | acggcgactg | 720 |
| ctgcaaacca | tgatattgat | cataagcaaa | aagaaaagga | tggcaatggc | acggagaaca | 780 |
| atgttccaga | agggggaagt | gcataacaaa | ccatcagggt | tctggggaat | gataaaaagt | 840 |
| gttaccactt | cagcatcagg | aagtgaataa | cttactctta | ttcaacagga | agtggatgct | 900 |
| ttggaagaat | taagcaggca | gctttttctg | gaaacagctg | atctatatgc | taccaaggag | 960 |
| agaatagaat | actccaaaac | cttcaagggg | aaatatttta | atcttcttgg | ttactttttc | 1020 |
| tctatttact | gtgtttggaa | aattttcatg | gctaccatca | atattgtttt | tgatcgagtt | 1080 |
| gggaaaacgg | atcctgtcac | aagaggcatt | gagatcactg | tgaattatct | gggaatccaa | 1140 |
| tttgatgtga | agttttggtc | ccaacacatt | tccttcattc | ttgttggaa | aatcatcgct | 1200 |
| acatccatca | gaggattgct | gatcactctt | accaagttct | tttatgccat | ctctagcagt | 1260 |
| aagtctccca | atgtcattgt | cctgctatta | gcacagataa | tgggcatgta | ctttgtctcc | 1320 |
| tctgtgctgc | tgatccgaat | gagtatgcct | ttagaatacc | gcaccataat | cactgaagtc | 1380 |
| cttgaggaa | tgcagttcaa | cttctatcac | cgttggtttg | atgtgatctt | cctggctcag | 1440 |

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gctctctcta gcatactctt cctctatattg gctcacaac aggcaccaga gaagcaaatg 1500
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tacactggaa ctctggggca agacatgtct atggttagctg agccaaacac gtaggatttc 1860
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agagactgta aaaaaaaaaa
1939

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<210> 52

<211> 1138

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1334051CB1

<400> 52

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tgaacaatct gtaaaactaaa ggatcctaata catgaaaata agtatgataa attataagtc 180
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cgtgaacacc accaccagcg ccacacatag cacagccacc atcctcaacc ctcgagatac 480
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tggcacttcc caagtccact ctgaatgtgg cctgatccta aacacaaatg ctgaattgtg 840
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tgtgatttgg cctatatact gatccaaaga aaagtcttgt gagtgtatta attttgggtg 1080
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<210> 53

<211> 2117

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1336728CB1

<400> 53

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cctggaggcc aggtacgtcg cccgcctcag tgccgccgcc gtcctgtacc tcagcaacct 360
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agccagcagc cgggaccctg tgccctcat cagctccage aacagctcca gtgtgtggga 840
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tccttgaaaa aaaaaaa 2117

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<210> 54

<211> 1495

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1452856CB1

<400> 54

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ctggagccca gcggcgggtg tgagagtccg taaggagcag cttccaggat cctgagatcc 180
ggagcagccg gggtcggagc ggctcctcaa gaggttactga tctatgaaat ggcagagaat 240
ggaaaaaatt gtgaccagag acgtgtagca atgaacaagg aacatcataa tggaaatttc 300
acagaccctt cttcagtga tgaagaagagg aggagggagc ggaagaaaag gcagaatatt 360
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aactccatgg cacaaggtta tgccaaacga atccagcagc ggttgaactc agaggagaaa 1440
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<210> 55

<211> 1747

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1562471CB1

<400> 55

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tcaggctact ccattgccac tcaaatacc ggtccaacaa cagtgaatgg cttggagcgg 180
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gaggtgaaga gggaccgggt gtccatcaag gacaatcaga aaaaccgcac gttcactgtg 360
accatggagg atctcatgaa aactgatgct gacacttact ggtgtggaat tgagaaaact 420
ggaaatgacc ttgggggtcac agttcaagtg accattgacc cagcaccagt caccaagaa 480
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aaaaaaa
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<210> 56

<211> 1473

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1618158CB1

<400> 56

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gacctgggtg accagtccac tgtgaggctg cccgaggctc ggatctcaga caatgggtccc 240
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ggaggaaaac cagcacccat ggtttatttc aaacgagatg gggaaccaat cgacgcagtg 480
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gccgagaacc ggggtggggc accctacacg gacgcccct cccgtggcct gacccagat 660
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tttccccgct ggggtccacag cgcgagccc acctacttcc tgcgccacag ccgcaccccg 780
agcagtgcag gcactgtgga agtacgtgcc ctgctcacct ggacctcaa cccacagatc 840
gacaacgagg ccctcttcag ctgcgaggtc aagcaccag ctctgtcgat gcccatgcag 900
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<210> 57

<211> 1591

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1656935CB1

<400> 57

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ctcttttagct ggactgaacc caaacatgaa tgtcaacagc atggacatga ccggtggctt 180
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gccccagaa ttccatccgg gagttccatg gaaaggactg cagaatattg accctgagaa 540
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<210> 58

<211> 1858

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 1859305CB1

<400> 58

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attcatctaa ttttactgc cgggcgaggt gtgagagccc tagcatctga aagtggctga 180
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agaaaagcaa gagactgtat gtatttttgg aactgggtgat tttggaagat cactgggatt 300
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<210> 59

<211> 1454

<212> DNA

<213> Homo sapiens

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<223> Incyte ID No: 1949083CB1

<400> 59

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<210> 60
<211> 2310
<212> DNA
<213> Homo sapiens

<220>
<221> misc_feature
<223> Incyte ID No: 1996357CB1

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<211> 744
<212> DNA
<213> Homo sapiens

<220>
<221> misc_feature
<223> Incyte ID No: 2061330CB1

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agtgtagagg tgatcgagtg tggatcaaga actggaacgt agcctctttg tgtccactgt 180


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caagcccaga caaccctgc agagtgaccc tgaagaagac gacaagccct gctccagtca 360
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actcagtaca aggtatgtag cccgagaaat gaccgacctg atgtgtgtta taaccatct 660
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<210> 62

<211> 1109

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2346947CB1

<220>

<221> unsure

<222> 30

<223> a, t, c, g, or other

<400> 62

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<210> 63

<211> 2511

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2795577CB1

<400> 63

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<210> 64

<211> 788

<212> DNA

<213> Homo sapiens

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<223> Incyte ID No: 3255825CB1

<400> 64

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<210> 65

<211> 1831

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3393430CB1

<400> 65

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<210> 66

<211> 1499

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3490990CB1

<400> 66

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<210> 67

<211> 365

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3635154CB1

<400> 67

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<210> 68

<211> 1102

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 4374347CB1

<400> 68

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<210> 69

<211> 2546

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 4596747CB1

<400> 69

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<210> 70

<211> 1845

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 5052680CB1

<400> 70

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<210> 71

<211> 1940

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 5373575CB1

<400> 71

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 <211> 880
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 <213> Homo sapiens

<220>
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<210> 73
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 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 5944279CB1

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(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 February 2001 (22.02.2001)

PCT

(10) International Publication Number
WO 01/12662 A3

(51) International Patent Classification⁷: **C12N 15/12**,
C07K 14/47, 14/705, 16/18, 16/28, C12Q 1/68, A61K
38/17, A01K 67/027, G01N 33/50

(21) International Application Number: PCT/US00/22315

(22) International Filing Date: 14 August 2000 (14.08.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/149,641 17 August 1999 (17.08.1999) US
60/164,203 9 November 1999 (09.11.1999) US

(63) Related by continuation (CON) or continuation-in-part
(CIP) to earlier applications:

US 60/149,641 (CIP)
Filed on 17 August 1999 (17.08.1999)
US 60/164,203 (CIP)
Filed on 9 November 1999 (09.11.1999)

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ,
DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,
NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM,
TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,
IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,
CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

(88) Date of publication of the international search report:
6 December 2001

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

WO 01/12662 A3

(54) Title: MEMBRANE ASSOCIATED PROTEINS

(57) Abstract: The invention provides human membrane associated proteins (MEMAP) and polynucleotides which identify and encode MEMAP. The invention also provides expression vectors, host cells, antibodies, agonists, and antagonists. The invention also provides methods for diagnosing, treating, or preventing disorders associated with expression of MEMAP.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/22315

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/12 C07K14/47 C07K14/705 C07K16/18 C07K16/28
 C12Q1/68 A61K38/17 A01K67/027 G01N33/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12N C07K C12Q A61K A01K G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, EMBL, STRAND, MEDLINE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | <p>DATABASE EMBL [Online] EMBL; ID AA984180, AC A984180, 28 May 1998 (1998-05-28) HILLIER L ET AL.: "am82a04.s1 Stratagene schizo brain S11 Homo sapiens cDNA clone IMAGE:1629582 3', mRNA sequence" XP002159906 Note: 99.6 % nt seq identity with SEQ ID NO:1 in 500 nt overlap. the whole document</p> <p style="text-align: center;">--- -/--</p> | 1-19,22, 25-28 |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier document but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
 "&" document member of the same patent family

Date of the actual completion of the international search

13 February 2001

Date of mailing of the international search report

15.05.01

Name and mailing address of the ISA

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Authorized officer

van de Kamp, M

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/22315

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | <p>DATABASE EMBL [Online] EMBL; ID AI243841, AC AI243841, 5 November 1998 (1998-11-05) STRAUSBERG R: "qh89e04.x1 Soares NFL T GBC S1 Homo sapiens cDNA clone IMAGE:1854I74 3' similar to contains element MER26 repetitive element ;, mRNA sequence" XP002159907 Note: 100.0 % nt seq identity with SEQ ID NO:1 in 412 nt overlap. the whole document</p> | 1-19,22, 25-28 |
| X | <p>--- DATABASE EMBL [Online] embl; ID AC005924, AC AC005924, 5 November 1998 (1998-11-05) MUZNY D ET AL.: "Homo sapiens Chr.14 PAC RPCI4-794B2 (Roswell Park Cancer Institute Human PAC Library) complete sequence" XP002159908 Note: 93.4 % nt seq identity of nt 17917-19843 with SEQ ID NO:1 in 1932 nt overlap. page 13</p> | 3-5, 11-15 |
| A | <p>--- DALMAU J ET AL.: "Ma1, a novel neuron- and testis-specific protein, is recognized by the serum of patients with paraneoplastic neurological disorders" BRAIN, vol. 122, no. 1, January 1999 (1999-01), pages 27-39, XP002159905 Note: 54.7 % aa seq identity of Ma1 with SEQ ID NO:38 in 333 aa overlap. abstract page 33, left-hand column, line 17 -page 34, left-hand column, line 2; figure 5 page 37, left-hand column, line 9-15</p> | 1-7,9-15 |
| A | <p>--- WO 98 21328 A (KATO SEISHI ;PROTEGENE INC (JP); SEKINE SHINGO (JP); SAGAMI CHEM R) 22 May 1998 (1998-05-22) the whole document</p> | |
| A | <p>--- WO 98 22491 A (MILLENNIUM BIOTHERAPEUTICS INC) 28 May 1998 (1998-05-28) the whole document</p> <p>--- -/--</p> | |

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/22315

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| A | <p>YOKOYAMA-KOBAYASHI M ET AL.: "Selection of cDNAs encoding putative type II membrane proteins on the cell surface from a human full-length cDNA bank"</p> <p>GENE, vol. 228, no. 1-2, 4 March 1999 (1999-03-04), pages 161-167, XP004159146 the whole document</p> <p style="text-align: center;">-----</p> | |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/22315

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

Remark (1): Although claims 18, 21 and 24 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition. Concerning claims 21 and 24, see also Remark (2).
2. ☒ Claims Nos.: 20, 21, 23, 24
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-28 all partially

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-28 (all partially)

An isolated polypeptide comprising or consisting of the amino acid sequence of SEQ ID NO:1 or homologs or fragments thereof, an isolated polynucleotide encoding a polypeptide as said, a recombinant polynucleotide containing a polynucleotide as said linked to a promoter, a host cell and a transgenic organism containing a recombinant polynucleotide as said, a method for producing a polypeptide as said, an antibody binding to a polypeptide as said, an isolated polynucleotide comprising a nucleotide sequence of SEQ ID NO:38 or homologs or fragments thereof, methods of detecting a target polynucleotide having a nucleotide sequence of a polynucleotide as said, a pharmaceutical composition comprising a polypeptide as said and the use of a composition as said in medical treatment, methods for screening for a compound that is effective as an agonist or an antagonist of a polypeptide as said, and compositions comprising a agonist or an antagonist as said as well as the use of compositions as said in medical treatment, methods for screening for a compound that binds to a polypeptide as said, that modulates the activity of a polypeptide as said, or that alters the expression of a polynucleotide as said, and a method for assessing the toxicity of a test compound involving the detection of a polynucleotide as said.

2. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 2 and 39.

3. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 3 and 40.

4. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 4 and 41.

5. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 5 and 42.

6. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 6 and 43.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

7. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 7 and 44.

8. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 8 and 45.

9. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 9 and 46.

10. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 10 and 47.

11. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 11 and 48.

12. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 12 and 49.

13. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 13 and 50.

14. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 14 and 51.

15. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 15 and 52.

16. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 16 and 53.

17. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 17 and 54.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

18. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 18 and 55.

19. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 19 and 56.

20. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 20 and 57.

21. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 21 and 58.

22. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 22 and 59.

23. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 23 and 60.

24. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 24 and 61.

25. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 25 and 62.

26. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 26 and 63.

27. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 27 and 64.

28. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 28 and 65.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

29. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 29 and 66.

30. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 30 and 67.

31. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 31 and 68.

32. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 32 and 69.

33. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 33 and 70.

34. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 34 and 71.

35. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 35 and 72.

36. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 36 and 73.

37. Claims: 1-28 (all partially)

As invention 1, but concerning SEQ ID NOs 37 and 74.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 20, 21, 23, 24

Remark (2): Claims 20, 21, 23 and 24 refer to agonists and antagonists of the polypeptide, and to compositions comprising such agonists and antagonists, without giving a true technical characterisation. Moreover, no specific compounds are defined in the application. In consequence, the scope of said claims is ambiguous and vague, and their subject-matter is not sufficiently disclosed and supported (Art. 5 and 6 PCT). No search can be carried out for such purely speculative claims whose wording is, in fact, a mere recitation of the results to be achieved.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/22315

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|--|--|
| WO 9821328 A | 22-05-1998 | AU 4885297 A EP 0941320 A | 03-06-1998 15-09-1999 |
| WO 9822491 A | 28-05-1998 | US 5952171 A AU 5354798 A EP 0948519 A | 14-09-1999 10-06-1998 13-10-1999 |